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TECHNICAL EDUCATION IN MICHIGAN COMMUNITY COLLEGES--CURRENT STATUS OF COLLEGIATE TECHNICAL PROGRAMS, AND FEASIBILITY OF PRE-TECHNICAL CURRICULUMS IN HIGH SCHOOLS.

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TO DETERMINE OPTIMUM HIGH SCHOOL PREPARATION FOR STUDENTS ASPIRING TO COLLEGE-LEVEL, INDUSTRIALLY ORIENTED, TECHNICAL PROGRAMS AND THE EXTENT TO WHICH HIGH SCHOOL GUIDANCE SERVICES ARE ACQUAINTING STUDENTS WITH CAREERS IN SEMIPROFESSIONAL AND TECHNICAL OCCUPATIONS, QUESTIONNAIRES WERE MAILED TO COUNSELORS OF SELECTED HIGH SCHOOLS AND TO COMMUNITY COLLEGES. REPLIES INDICATED NEED FOR BETTER COLLEGE PUBLICITY THROUGH VISITATION PROGRAMS AND PRESS RELEASES, AND BETTER COUNSELING SERVICE AND SCHOLARSHIP ASSISTANCE. HIGH SCHOOLS COULD ENHANCE INDUSTRIAL DEPARTMENT STATUS, PROVIDE CAREER SEMINARS, AND IMPROVE COUNSELOR-PUPIL RATIOS. A SUMMARY OF FINDINGS FROM 1,637 TECHNICAL ENROLLEES IN 1963 SHOWED THAT ONLY 10 PERCENT OF THE HIGH SCHOOL GRADUATES ENROLLED FOR FULL-TIME STUDY IN OCCUPATION-CENTERED PROGRAMS. REASONS GIVEN FOR LOW ENROLLMENT WERE (1) INADEQUATE VOCATIONAL GUIDANCE (30 PERCENT), (2) LACK OF INTEREST (62 PERCENT), AND (3) LACK OF CAREER INFORMATION (60 PERCENT). POOR GUIDANCE ARTICULATION BETWEEN HIGH SCHOOL AND COLLEGE COUNSELORS, INSTRUCTORS, OR TECHNICAL PROGRAM DIRECTORS WAS INDICATED. EIGHTY PERCENT OF COMMUNITY COLLEGE RESPONDENTS FELT THE FOLLOWING "PRETECHNICAL" HIGH SCHOOL COURSES WERE IMPORTANT--ENGLISH, ALGEBRA, GEOMETRY, DRAFTING, TRIGONOMETRY, PHYSICS, BASIC SHOP, AND SOCIAL STUDIES. (DE)

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THE UNIVERSITY OF MICHIGAN
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TECHNICAL EDUCATION IN MICHIGAN COMMUNITY COLLEGES

Current Status of Collegiate Technical Programs, and Feasibility of Pre-Technical Curriculums in High Schools

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FOREWORD

One of the critical manpower problems facing the nation and the State of Michigan is the maintenance of an adequate supply of semi-professional and highly-skilled personnel to fill jobs at the technician level in support of engineers, designers, planners, and scientists. Because of the growing complexity of industry due to technological advances, increasing numbers of technicians are needed in the research, development, design, testing, and production phases of Michigan's corporations and manufacturing companies. Such jobs require education and training beyond the high school, usually in planned curriculums of two years' duration. Community junior colleges and technical institutes are the educational organizations which generally offer such curriculums.

Since Michigan has no publicly supported technical institutes, the present study has been concerned with the state's publicly supported community junior colleges and the problems associated with technician education in these institutions. A major problem is the recruitment of adequate numbers of high school graduates appropriately prepared and informed about technical occupations. Although several facets of technical education were involved in the overall study, one of the central purposes of the research project was to arrive at some consensus as to the optimum high school preparation for future success in a technical curriculum at the community junior college level.

The study was conducted during the spring months of 1964, and involved widespread participation of high school guidance directors and community junior college personnel. It was funded under a grant from the Michigan State Board of Control for Vocational Education and is concerned only with those technologies related to industrial production.

Our gratitude is extended to the following:

The guidance directors and counselors of selected Michigan high schools; and the community college officials and instructors who provided both actual data and carefully considered opinions.

To Dr. Albert Kubany and Dr. Harry Patterson of General Motors Institute for counsel in preparing and analyzing the questionnaire material. To the personnel of the Computer Services of General Motors Institute—Miss Laura Steele, Mr. Larry Cook, and Mrs. Diana Neil, who prepared the key punch data from the high school questionnaires and did the machine compilation of the results.

The Office of Research Services of the School of Education, The University of Michigan, for assistance in preparing the questionnaire.

Special acknowledgement is made of the painstaking and detailed work of the clerical staff of the Department of Vocational Education and Practical Arts, Mrs. Phyllis Boaz and Miss Barbara Hall, in preparing and mailing questionnaires, and in typing and editing the report.

It is hoped that the findings will be of significant interest and value to high school and community college personnel throughout the state of Michigan. The findings suggest educational needs which must be met for large numbers of Michigan youth if the state is to keep pace with changing technology.

Norman C. Harris
William R. Yencso

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Introduction ---- RATIONALE FOR THE STUDY

NEW JOBS BEING CREATED
VOCATIONAL GUIDANCE IN HIGH SCHOOL IS THE KEY
OLD JOBS OBSOLETE
A

Employers report: Unskilled jobs are disappearing
National manpower studies show: Technical jobs are increasing
Community college officials say: Technical education awareness is rising
High school counselors report: Guidance is increasingly important

INTRODUCTION—RATIONALE FOR THE STUDY

--A rapidly changing occupational structure in America could lead to an educational disaster gap. Manpower problems are really educational problems.

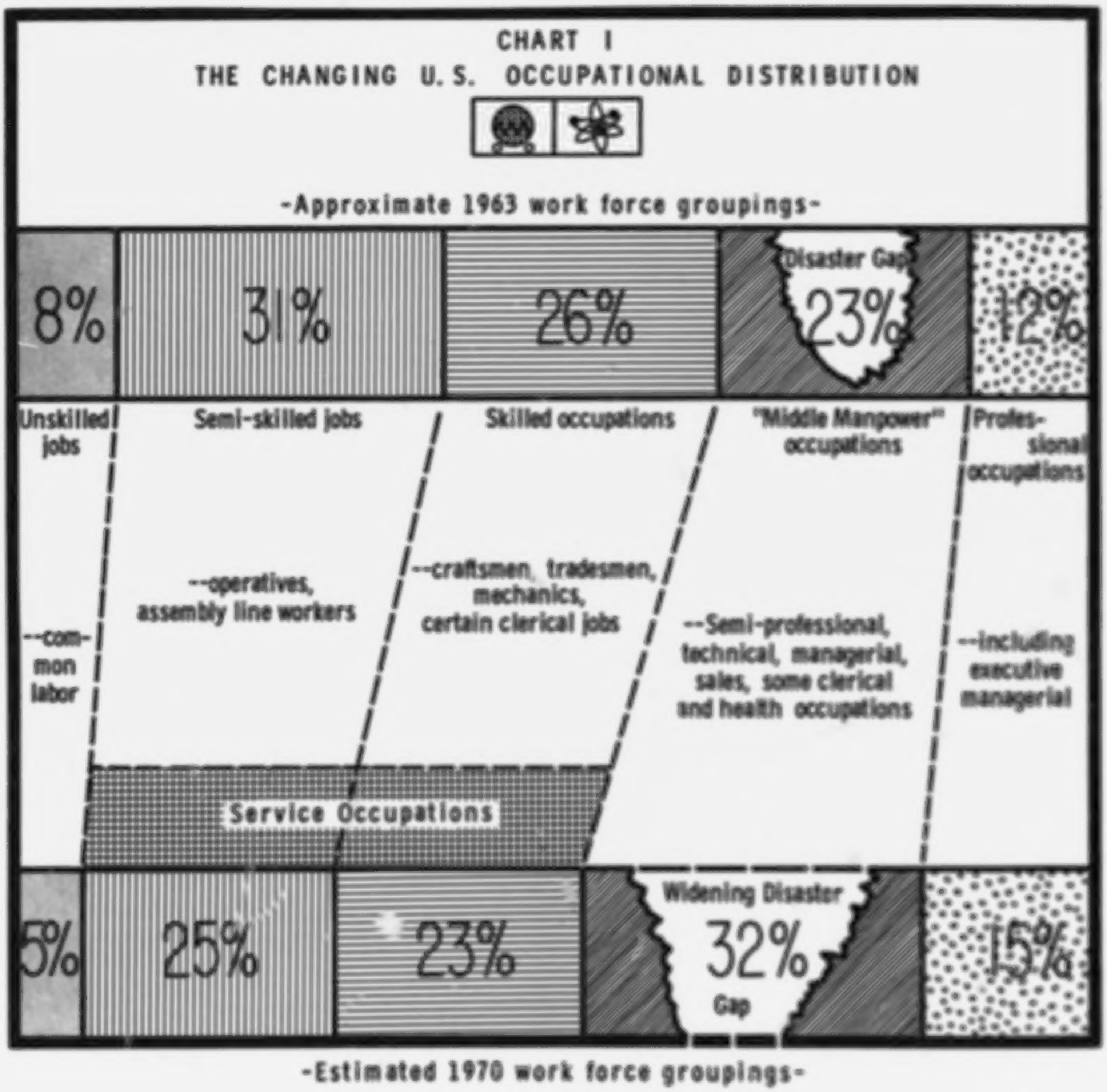


CHART I
THE CHANGING U.S. OCCUPATIONAL DISTRIBUTION

Source: The percentages in the above chart were extrapolated from publications of the U.S. Department of Labor, and at best are approximate. However, certain persistent trends are indicative of the increase in those job opportunities which require the most education and training.

FACTORS RELATED TO THE EDUCATIONAL DISASTER GAP

EMPLOYERS REPORT:

Unskilled jobs are disappearing—Jobs at all levels becoming more complex—High school dropouts are unemployable—High school graduates need more training and more maturity—A broader base in mathematics, science, and general education is essential—Qualified technicians are in short supply.---

NATIONAL MANPOWER STUDIES REVEAL:

The unskilled and the uneducated make up the "hard core" unemployed—The year 1970 will mark the virtual disappearance of the unskilled job in industry—Professional and technical jobs, as a group, are increasing at a faster rate than any other segment of the labor force—Nearly 70,000 new technicians will be needed annually for the next decade.---

COMMUNITY COLLEGE OFFICIALS REPORT:

Increasing awareness by the general public of the role of the community college in providing technical education—Sharply increased capitol and operating budgets for technical education programs—Increasing recognition of these programs and their graduates by industry.---

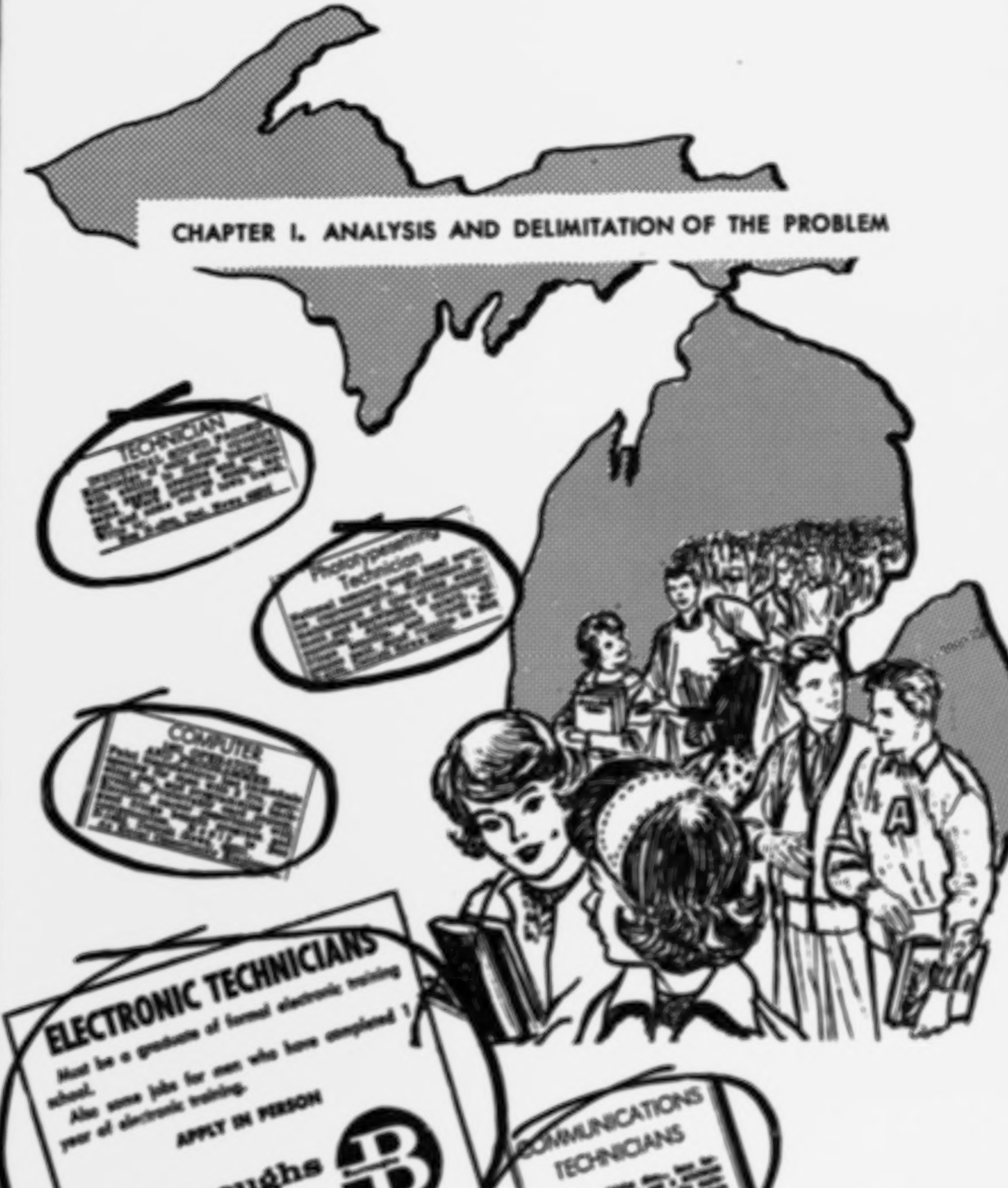
— But Conversely —

Lack of properly prepared candidates for entry into college level technical programs—Parental reluctance to encourage youth to enroll in technician programs—Lack of adequate occupational information about semi-professional and technical (i.e. middle manpower) jobs—Need for increased liaison between community colleges and high schools in order to bring about a better understanding of technician jobs and technical education programs.---

HIGH SCHOOL OFFICIALS REPORT:

High school youth and their parents not aware of increasing opportunities in middle manpower fields—Inadequate budgets for vocational guidance—Dwindling enrollments in some vocational programs concurrently with serious dropout rates from "general" and college preparatory programs—Markedly increased rigor of college preparatory programs—Increasing difficulty of getting into college (i.e. four-year colleges) for all except very superior students—No "tracks" or curriculums specifically tailored for future technician students in community colleges—Lack of knowledge about community college technical education programs.---

CHAPTER I. ANALYSIS AND DELIMITATION OF THE PROBLEM


TECHNICIAN
Phototypesetting Technician
COMPUTER
ELECTRONIC TECHNICIANS
Must be a graduate of formal electronic training school.
Also some jobs for men who have completed 1 year of electronic training.
APPLY IN PERSON
Burroughs Corporation
B
COMMUNICATIONS TECHNICIANS
A

INTRODUCTION

As Michigan, with the nation, moves into the middle of the 1960-1970 decade, change is evident on every front; sociological, political and technological. Historically, technological advances are woven into the warp and woof of our society. The catalyst for the major socio-cultural changes now taking place may be due for the most part to the vertical advances of our technology over the past three decades. The extreme tensions which are evident throughout the manpower structure may be the result of an educational structure which, for average youth at least, has merely expanded horizontally.

CHOICES OPEN TO HIGH SCHOOL GRADUATES

The frustration of being denied admission to college and at the same time being ill-prepared to enter the world of work is one which thousands of "middle level" high school graduates are experiencing today. In many states these youth have no recourse but to remain unemployed, join the armed forces, or gradually infiltrate the labor force through part-time, pick-up jobs. In many Michigan communities, however, such youth have a much more acceptable alternative—further education at the local community college. Some of this "middle group" may eventually move on to a four-year college and a baccalaureate degree, but most of them are best suited to community college occupational education programs. Tuition is low at Michigan's community colleges, all high school graduates are acceptable for entrance, and community colleges are rapidly increasing in numbers so that soon the youth of most areas of the state will have ready access to post-high school occupational education.

However, there remain three troublesome factors in this otherwise favorable picture:

1. Most of these youth have little if any real understanding of the career opportunities available to them in the semi-professional and technical occupations.

2. Most of these youth are not adequately prepared to enroll in and succeed with college-level technical studies.

3. Many youth (perhaps comprising a third of the graduates of Michigan high schools each year), even though they completed a "college-prep" curriculum with a "C" average or less, still think of themselves as baccalaureate degree aspirants, and, with their parents as willing accomplices, they insist on enrolling in university-parallel curriculums in community colleges even when all the facts (high school grades, standardized test scores, etc.)

indicate that an associate degree objective would be a far wiser choice.

Sociological pressures then (as evidenced by a lack of interest in "non-professional" jobs and in "less-than-baccalaureate degree" educational programs) are in some ways at loggerheads with technological developments. Community college occupational education programs are thus trapped in the middle of a "squeeze play" between these two contending forces. The escape from the trap will involve at least two major moves:

1. Widespread dissemination of information about middle manpower job opportunities—the working conditions and the salary or wage income—to young people and their parents, and

2. Re-structuring of the high school curriculum and guidance services so that a concept emerges of college education and training for many students which is of a type and level other than the traditional baccalaureate degree programs.

POPULATION AND LABOR FORCE CHANGES

In Michigan, dramatic changes are taking place in the population and labor force. There are presently three million youth under 20 years of age, with one million under the age of five. The state's labor force will show a net increase of 720,000 workers in this decade. The Michigan Employment Security Commission points out that the job picture is changing to a situation where occupations are less repetitive and more interesting, but more of these new jobs require a higher level of education.* A few findings of a study by the Commission on Children and Youth of the City of Detroit** are quoted here as further evidence of changes affecting youth in this decade:

1. "A two-thirds increase in the number of 18-year olds in Michigan is expected between 1960 and 1970. Some 1,200,000 persons will reach this age during the 10-year period."

2. "Post-high school facilities must almost double in Michigan in the next ten years to meet the demand for professionally and technically trained people."

---

*Manpower in Michigan—A Look at the 1960's, Michigan Employment Security Commission, 1962, p. 17.

**Commission on Children and Youth of the City of Detroit; Some Facts About Youth Employment; the Commission, Detroit, 1961.

3. "Facilities to train the technicians needed in the next ten years are inadequate, and where private technical and vocational schools are used, expensive. There will be a great deal of demand for technicians in the next ten years, possibly 150,000 new positions in Michigan."

A more recent study in Washtenaw County sharpens the focus on the youth-job picture with these findings:*

> "For the last three decades, population in Washtenaw County has increased at a faster rate than for the state as a whole. During the last decade while total county population was increased 28 percent, population ages 5-14 years increased 73 percent.
>
> "A 32 percent growth is expected by 1967 in the number of technical and semi-professional jobs.
>
> "Washtenaw County employers in general feel that new high school graduates are not ready for employment with their firms, except in jobs at the unskilled and semi-skilled levels."

On the national scene, the need for semi-professional and highly-skilled technicians to work in supporting roles in research,prototype production, and testing jobs, is also well documented. The National Science Foundation, based on a research study conducted in 1963-64** concluded that by 1970 the total national need for technicians in industry will exceed 1,290,000. This figure, when contrasted with the 775,000 employed in 1960, indicates that the supply of technicians must increase by 67 percent in this decade. Allowing for deaths and retirements, as well as for new demands, almost 64,000 new technicians per year will have to be educated and trained to meet the 1970 estimated demand. The 1970 NSF estimate is based upon the present ratio of technicians to engineers and scientists of 0.7 to 1, but many authorities feel that, for effective utilization of professional personnel, this ratio should increase to 1.5 to 1 or even 2 to 1. During the first two years of the decade (1961 and 1962) schools and colleges produced only about 30,000 semi-professional and highly skilled technicians per year. What are some of the barriers to progress in closing this gap?

---

*The University of Michigan, Bureau of School Services; Citizens' Survey of Washtenaw County Community College Possibilities, A survey directed by Raymond J. Young, Ann Arbor, Michigan; The University, July, 1963.

**National Science Foundation, Scientists, Engineers, and Technicians in the 1960's, NSF 63-64, U.S. Department of Labor, BLS, Washington, D.C., 1964.

BARRIERS TO PROGRESS IN MICHIGAN

The Commission on Children and Youth study previously referred to identified two critical problems—a shortage of post-high school educational facilities in general, and a shortage of facilities to educate and train technicians in particular. To these may be added an equally critical shortage—that of qualified faculty for technical education programs.

However, there is another barrier to progress, and that is the lack of adequate preparation of high school students for subsequent entry into college level technical programs. The demands of most semi-professional and highly-skilled technician jobs require the equivalent of two years of post-high school technical training involving significant work in mathematics, science, English, and certain other common learnings, as well as rigorous course work in the technical specialty, whether it be electronics, mechanical, civil, or chemical technology.* In order to complete these requirements in a two-year curriculum in a community college it is almost essential to start the freshman year with courses which presume a working knowledge of elementary algebra, geometry, elementary physics, and mechanical drawing; the ability to read rapidly and well, and to write with reasonable clarity and precision; and some background of skill and knowledge in the use of hand tools, machine tools, and precision measuring instruments.

Exact information on selection and retention rates in Michigan community college technical education programs is not currently available, but studies of this problem in other states, notably California and Florida, indicate that fully fifty percent of junior college freshman students desiring or electing technical curriculums are not properly prepared to undertake the first semester courses involved.

Related to the problem of inadequate preparation for technical studies is the lack of adequate information on technical occupations. The rapidly growing semi-professional and technical segment of the occupational spectrum is one which receives too little attention from high school counselors as they discuss career possibilities with their students. The "lack of status" factor, alluded to on a previous page, makes it necessary for counselors to spend a great deal of time discussing such occupational choices with students. In the typical high school, counseling time in most cases is not adequate, even if informative brochures and leaflets were readily available.

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*The American Society for Engineering Education; Characteristics of Excellence in Engineering Technology Education, James L. McGraw, Project Director, Urbana, Ill.: the Society, 1962, p. 24.

From last year's "Manpower Report of the President,"* these comments highlight the counseling problems:

> "Rapidly increasing demands for counseling services have led to a great need for additional personnel in the counseling profession—demands for professional competence and need for improved and broadened pre-service and in-service training and other measures to strengthen the quality of personnel resources in the profession. The demand for school counselors will be greatly increased in the next few years by rising school enrollments and by the need to lower the student-counselor ratios in many secondary schools and to extend the counseling to lower grades."

Paramount among guidance and counseling needs in Michigan is the necessity for increased numbers of trained vocational counselors; that is those persons who are thoroughly familiar with today's rapidly changing technologies; who can interpret conditions as they are today and make reasonable forecasts of conditions which will probably exist when the student begins his career. More students need to become acquainted with areas of work which are consistent with their aptitudes and interests. A complete counseling and guidance service must be provided, which utilizes many indicators of future performance—standardized tests, previous scholarship, interests, and job experiences. Most counselors are well acquainted with academic and college preparatory programs and with four-year college requirements, but not very many are familiar with the needs of industry and with the technical and semi-professional occupations.

It would seem essential to begin vocational counseling on a general basis at the junior high school level. By making occupational and employment information available to students early in their school careers, they would gradually be able to relate these ideas to their own specific abilities and interests prior to the time of making curriculum decisions in the senior high school which would affect their educational goals and lifetime careers.

---

*United States Department of Labor, Manpower Report of the President, A Report on Manpower Requirements, Resources, Utilization, and Training, Washington, D.C., March, 1964.

LACK OF PROPER BACKGROUND IN SCIENCE AND MATHEMATICS

In a study by the Los Angeles City Junior College District,* a further reason for the lack of interest by high school students and high school graduates in technical occupations was found to be related to high school mathematics and science instruction:

> "82.4% of the senior high school students who were not interested in any technical occupation gave as reasons their lack of interest in the science or mathematics courses they had previously taken. This very high percentage, which also follows through the junior college study, is an indicator that mathematics and science courses must be made more interesting and practical (underscores by the present authors) as related to specific curriculums."

Comments made by junior college students attending the two Los Angeles junior colleges surveyed in the Dauwalder study also stressed the importance of counseling:

> "...a larger percentage would have enrolled in technical curricula if they had been counseled in these areas earlier. The students believed that a decision to enter technical occupations should be made in the secondary schools (underscores by the present authors) and that more preparation should be available there. Emphasis must be placed on the selection of a technical field as early as possible. This requires that school administrators and counselors remain constantly familiar wich changing industrial needs."

These comments from a study in another state indicate that there is a high correlation between adequate counseling and guidance for technical curriculums, on the one hand, and in interest in science and mathematics of the appropriate kind and level on the other. Both are related to an interest in the technical occupations as future career choices. With regard to high school science and mathematics, however, a word of explanation is in order.

Traditionally, high school curriculums are usually of three kinds or "tracks": the college preparatory track, the vocational track, and the general track. Students in the vocational track typically receive very little science and mathematics instruction. Those in the general track may have one course in each field, usually oriented toward their needs as future citizens and consumers. On the other hand, science and mathematics courses for "college prep" students have, in recent years, been up-graded in theoretical content and rigor to the point where only the extremely able students enjoy and succeed in these studies.* Necessary as such courses are for our future scientists, mathematicians, and other professional workers (perhaps one-eighth of a typical high school age group), they are not suited at all to the interests, abilities, or needs of the large group (perhaps 50 percent of a typical high school age group), of middle-level ability students from which will come future technicians and semi-professional workers.

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*Dauwalder, Donald D., Education and Training for Technical Occupations, part 1-a, Study of Industries and Schools in San Fernando Valley, California, Relating to the Education and Training Required for Technicians and Related Occupations: Los Angeles: Los Angeles City School District, Division of Extension and Higher Education, 1961.

The net result is that large numbers of good-to-average students shy away from high school physics and mathematics courses; and further, many who do enroll in them find that their interest is killed off or their self-confidence is destroyed by the highly theoretical approach and extreme rigor encountered. Two unfortunate outcomes are evident as these students later enroll in community colleges:

1. Those who took the theoretical and rigorous high school courses and fared poorly have developed such a dislike for science and mathematics that they will not consider enrolling in a technical program since it too involves science and mathematics.

2. Those who (perhaps wisely) avoided the "new" mathematics and the "new" physics as offered for the very able "college prep" students, received little if any science and mathematics instruction in high school and are therefore not prepared to begin a technical education program in the community college. When informed that a semester or more of "repair" or remedial work will be involved before they can begin the regular technician program they too are likely to be negative about a technician objective in the community college.

What is now needed is a development of mathematics and physical science sequences in the high school designed to suit the abilities and interests of middle level students—courses with stress on applications to future occupations within the "middle manpower" spectrum.

The idea that specially structured mathematics and science sequences in high school should be offered for students of middle-level abilities is just as defensible as the idea that specialized courses should be offered for the very superior students. It is well to remember that "middle level" students comprise 50 percent of an age group, while superior students make up less than 25 percent of the age group.

---

*The PSSC physics program and the SMSG mathematics program are examples of the "new" and very theoretical approach to these subject matter areas.

RECAPITULATION

As a result of the unprecedented technological advances of the past three decades a "disaster gap" has opened up between that (small) segment of our population with advanced education and training and the rest of our citizens whose educational achievement ended with high school graduation or something less.

Post-high school education and training of from one to two (or perhaps even three) years is becoming recognized as a necessity for at least a third of our work force.

Large numbers of high school graduates have neither saleable skills with which to seek employment, nor adequate educational preparation to enter and be successful in college level technical programs. Compounding the "educational disaster gap" is the high school dropout problem, particularly as it involves youth of average and above average scholastic ability. According to the U.S. Office of Education * some 82,000 youth who dropped out of high school in 1963 had the native intelligence and ability to complete a baccalaureate degree college program and an additional 375,000 dropouts had the potential to complete a two-year associate degree, semi-professional or technician training program.

Here then is a tragic paradox—a waste of human resources and talent at the very point in time that our economy and perhaps our national survival are demanding increasing levels of performance from all citizens. This "disaster gap" must be bridged, and the time for bridging it is short.

Two massive efforts would seem to be indicated and they apply not only to Michigan, but to the nation as a whole.

1. Develop to the fullest extent possible systems of community junior colleges characterized by low tuition and fees; non-restrictive admissions policies; comprehensive educational programs for both university-parallel and occupational purposes; and strong guidance programs to assist students in making realistic choices among educational and career goals.

2. Re-structure secondary school programs, with the following objectives and hard facts in mind:

   a. Without any decrease in attention to the needs of the most able 25 percent of youth, begin to give equally forceful and effective attention to the needs of the other 75 percent of the high school

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*Commitment to Youth, A Report on Five Years of Progress in Guidance, Counseling, and Testing, 1958-59/1962-63. Under Title V of NDEA, Washington, D.C.: U.S. Government Printing Office, 1964.

students.

b. Since every manpower study made in recent years shows that high school dropouts are virtually unemployable, and that new high school graduates also, for the most part, are not ready for career jobs, recognize these facts and re-orient high school programs for the middle group of high school students toward the objective of preparing them for post-high school occupational education. To the "three tracks" now operated by most high schools (i.e. college-prep, vocational, and general) there should probably be added a "fourth track," which for Michigan would have as its objective the preparation of students for entry into community college occupational programs. Many students from each of the present high school tracks might be far better served by this "fourth track."

LIMITATIONS OF THE PRESENT STUDY

Up to this point the discussion has concerned itself with rather broad educational principles and problems related to the needs of the middle 50 percent of high school students.* Certainly a concerted attack supported by carefully planned research, should be made across this entire educational front. The present study, however, is limited to a specific section of this front—the education and training programs in high schools and community colleges which lead to occupational competence as a technician in industry. The area of investigation of the present study has to do with technician education programs in community colleges and with the adequacy (or lack of it) of high school preparation in Michigan's high schools, for entry into and success in community college technical education curriculums. The study specifically explores the thinking of knowledgeable and responsible persons on both levels, as to the feasibility of pre-technical programs in Michigan high schools.**

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*The least able 25 percent (academically speaking) are not considered as potential technicians, semi-professional, and business workers. The high school should plan other vocationally-oriented programs for these youth.

**The concept of "pre-technical" work in high schools is not original with the authors. See The Richmond Plan, a report of a cooperative study between Cogswell Polytechnical College and the Richmond (California) Union High School District; Cogswell Polytechnical College, San Francisco, 1962.

SOME DEFINITIONS

"Technical education" is a term which needs defining for the purposes of this study. Broadly interpreted, technical education:*

1. is organized into two-year curriculums at the post-high school level;

2. emphasizes work in technical skills and in the use of instruments, tools, and precision measuring equipment;

3. gives strong emphasis to mathematics, science, and engineering knowledge, all at a practical, or applied level;

4. includes a core of general education studies (English, humanistic-social studies, liberal arts) up to perhaps one-fourth of the total credit hours.

5. leads to occupational competence in one of the technical occupations, and usually to the attainment of the associate degree from a community college or technical institute.

The present study is limited to technical education for industry—that is preparation for the kinds of jobs available in Michigan's _industrial economy_ for persons with one or two years of community college technical education.

In industry there is a rather broad range or "spectrum," of technical jobs. They range in complexity and sophistication all the way from highly-skilled jobs closely related to the skilled trades, to complex and theoretically-oriented jobs very closely associated with the work of graduate engineers and/or scientists. Within this broad spectrum of jobs there has emerged a rough classification of two types of technicians:

1. The _industrial (or highly-skilled) technician_, who works at the end of the spectrum closest to the skilled trades.

2. The _engineering (or semi-professional) technician_, who works at the end of the spectrum closest to the engineer.

It is obviously impossible to separate technicians neatly into these two categories. The job pattern, from the skilled craftsman all the way to the research scientist, is really a _continuous spectrum_, and clear-cut distinctions cannot always be made. The two terms above suggested do, however, have considerable usefulness in describing technician jobs and in planning community college educational programs for future technicians.

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*Adapted from: _Technical Education in the Junior College by_ Norman C. Harris: The American Association of Junior Colleges, Washington, D.C., 1964, p. 21.

Some further amplification of the accepted meaning of these terms will help to clarify the discussions to follow and the findings of this study.

> Highly Skilled (Industrial) Technician.—"The industrial technician is one who does not require an extensive knowledge of science and engineering in depth to perform his work. When an industrial technician is working he uses more craft and manipulative skills than he does engineering knowledge.
>
> "Some technical occupations are very limited in scope and level. In this group may be found such jobs as product inspection...or routine engine testing...Such jobs are clearly not far from the craft worker, but are differentiated by the necessity for the technician to apply some science and engineering knowledge.
>
> "Some technical occupations deal with a large number of different skills and knowledge (scope) but do not require depth of knowledge (level)...and therefore are classed as industrial technicians' jobs. Such jobs include the laboratory technician who is capable of performing all the common tests, but is not able to interpret results; or a draftsman who is accomplished in mechanical, electrical, or aeronautical drawings but performs few layout or design functions."*
>
> Semi-Professional (Engineering) Technicians.—"Technicians work with engineers and scientists in virtually every aspect of engineering and scientific work. One of their largest areas of employment is in research, development, and design work. Technicians in this type of activity generally serve as direct supporting personnel to engineers or scientists. In the laboratory, they conduct experiments or tests; set up, calibrate, and operate instruments; and make calculations. They may assist scientists and engineers in developing experimental equipment and models, do drafting, and frequently assume responsibility for certain aspects of design work under the engineer's direction."**

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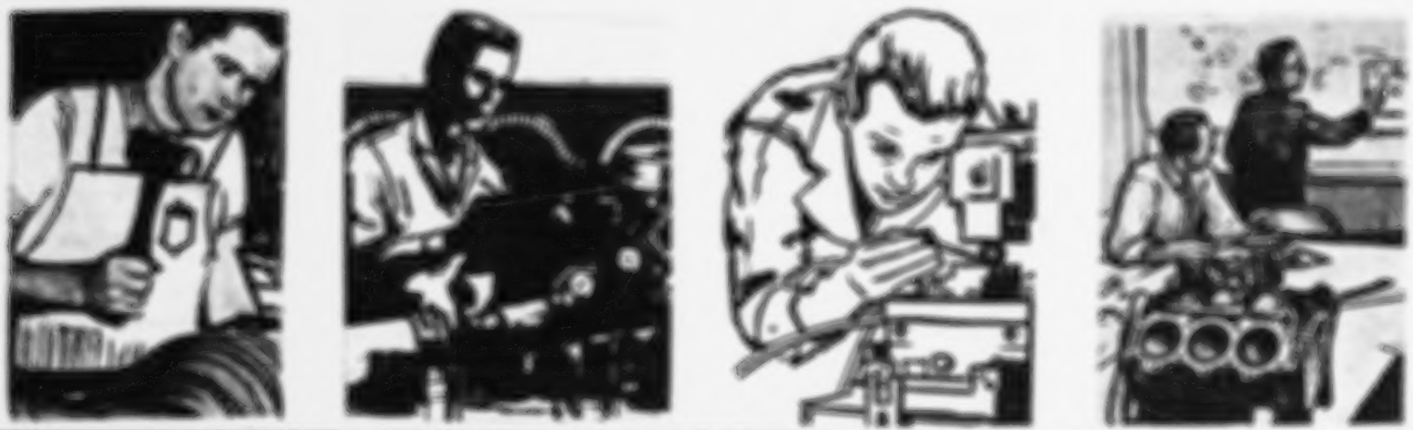
*Harvard University, Graduate School of Business Administration, Managing Technician Manpower, A Report to Industry, Cambridge, Mass.: the University, 1959.

**U.S. Department of Labor, "Employment Outlook for Technicians who Work with Engineers and Physical Scientists.", Bureau of Labor Statistics, Bulletin No. 1300-96, Washington, D.C.: Government Printing Office, 1963 (Reprint of article in Occupational Outlook Handbook, 1961).

The accompanying "spectrum chart" may assist in further classification of the relationships among the various kinds of workers in the technician spectrum.

CHART II*

THE TECHNICIAN JOB SPECTRUM IN INDUSTRY



CRAFTSMEN and SKILLED TRADESMEN	overlap	HIGHLY-SKILLED (Industrial) TECHNICIAN	overlap	SEMI-PROFESSIONAL (Engineering) TECHNICIAN	overlap	PROFESSIONALS- (Engineers and Scientists)
Production jobs requiring abilities and manual skills of a high order with occasional need for technical knowledge. Generally gains the skills and knowledge through apprentice training. Maintenance, repair, and construction.		Jobs of a somewhat routine nature in testing, maintenance, and prototype production, but requiring a balance of skills and technical knowledge. Usually works under supervision in detail drafting, checking, estimating, and production.		Jobs requiring a high degree of scientific and mathematical knowledge with some manual skills. Working in research, development, and design directly in support of scientists and engineers. May hold supervisory jobs requiring both technical knowledge and ability to handle people.		Basic research, development, testing, and design. Directs research and production activities. Emphasis is on intellectual content, not skills. Develops ideas into tangible results.

increasing ← MANIPULATIVE SKILLS → decreasing

decreasing ← INTELLECTUAL DEMANDS → increasing

The technician has a role between the engineer and the craftsman in industry, between theory and production. His official title basically depends on the day-to-day jobs which he performs. If they are in the realm of routine testing or detail drafting, for example, then the title "industrial technician" is most appropriate. If however, his job assignments are in assisting an engineer in planning and development work requiring a high degree of creative and technical talent, then the appropriate title is "engineering technician." Limiting factors are the kinds and level of educational preparation the technican received, which in turn limit his capabilities on the job. There are also many technical jobs for women in industry—such as chemical aides, routine analysts, mathematics aides, and laboratory technicians. Women, too, can be employed at the two levels of technical occupations.

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*Adapted from: Technical Education in the Junior College by Norman C. Harris: The American Association of Junior Colleges, Washington, D.C., 1964, p. 36.

STATEMENT OF THE PROBLEM

Accepting the foregoing discussions and documentation as a framework within which to operate, the problem of the present study can be expressed generally as follows:

> To ascertain, from high school and community college personnel in Michigan, information about technician curriculum offerings and guidance procedures, and to elicit the opinions of knowledgeable and responsible educators at both levels about the possibility of pre-technical programs in Michigan high schools."

Specific Objectives

The following specific objectives are identified:

1. To elicit opinion from high school personnel as to the extent to which guidance services are acquainting students with the technical occupations as career choices.

2. To ascertain the opinions of high school principals and counselors throughout the state, as to the reasons for lack of interest in the semi-professional and technical occupations as career choices by high school students.

3. To gather data on the subject matter content of typical curriculums offered in high schools.

4. To quiz high school principals and counselors as to their perception of what a technician does, and what kind of education and training he needs.

5. To obtain the opinions of high school administrative and guidance personnel about the "optimum" high school preparation which students should have if they intend to enter community college technical education programs.

6. To increase the awareness of high school principals andcounselors of the important role of the "middle manpower" occupations in Mihigan's economy.

7. To gather facts from community colleges as to the kind od level of technical education programs offered, and the numbers of student enrolled.

8. To ascertain the considered opinions of community collee guidance personnel and deans (directors) of technical education as to the"optimum" preparation which new high school graduates should have for entr into the technical education programs of community colleges.

9. To determine the degree to which educators at both leves (secondary and community college) feel that there is a need for "pre-technial" curriculums in Michigan high schools.

10. To combine the opinions of high school personnel and comunity college personnel into a suggested pre-technical curriculum for Micigan high schools.

CHAPTER II. METHODOLOGY OF THE STUDY

--Data and opinions from high school guidance personnel--

--Data and opinions from community college officials--

The gathering of data and opinion for the study was divided into two phases—a high school phase, accomplished by a mail-out questionnaire; and a community college phase, accomplished by personal interviews, using a previously prepared interview instrument, with deans and directors of technical programs at Michigan's eighteen functioning community colleges.

THE HIGH SCHOOL STUDY

From Michigan's more than 800 public and private high schools, 182 were selected for inclusion in the study.*

The questionnaire (see Appendix C) was designed to solicit facts and opinions from counselors in the selected group of Michigan high schools. After a "pilot study" and a series of refinements it was finalized and mailed to the high school principals, who were requested to refer it to the director of guidance services or head counselor. One purpose of the instrument was to measure the extent of counselors' knowledge about the semi-professional and technical occupations inthe Michigan economy. Information was also sought on the extent of availability, in the high school counseling offices, of meaningful and attractive career guidance materials in the middle manpower field. An attempt was made to ascertain the numbers of high school students who had been advised in recent years to consider the technical occupations as a career, and how many had been advised to attend a community college for the required education and training. An additional objective of this questionnaire was to ascertain the kind of high school curriculum which is currently being recommended and offered in Michigan high schools for students whose probable future objective is community college study in a technical field. A final objective was to elicit counselors' suggestions for courses and experiences which ought to be included in a suggested pre-technical program for those high school students aspiring to enroll in two-year collegiate-level technology programs.

On May 2, 1964, these 182 questionnaires were mailed out to the principals of the selected high schools with a cover memorandum and a "disaster gap" leaflet (see Appendix A). The principals were asked to hand the questionnaire to the guidance director or the person best qualified to answer it. Two weeks later, a reminder letter and a duplicate questionnaire were mailed to those who had not yet responded.

The total number of useable questionnaires returned amounted to 148, or 81.3 percent of those sent out. Three complete questionnaires were returned after the deadline, and two questionnaires were lost in the mail. The high percentage of high schools responding would seem to indicate a great deal of interest by high school officials in the problem being studied—that of educational and career goals for the vast "middle group" of high school students. The sampling of high schools chosen included nearly 40,000 of the 1963 high school graduates in Michigan, or about 53 percent of the total for that year. Eighty-five percent of the questionnaires were filled out by head counselors or counseling personnel and 15 percent were filled out by administrators (principals, assistant principals, or others).

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*The method used in selecting the high schools to be included is explained on page 20.

The returned questionnaires were coded for IBM card key-punching and the factual and short-answer type data were compiled by data processing equipment. The opinions and general comments were compiled by the clerical staff of the Department of Vocational Education and Practical Arts at The University of Michigan.

THE COMMUNITY COLLEGE STUDY

An interview instrument (see Appendix B) was devised to be used in eliciting both opinion and actual data about the semi-professional and highly-skilled technician programs in Michigan's community colleges. The major objective of this instrument was to gather data and opinion which might be used to suggest an optimum high school pre-technical program of studies. Information was also solicited about technical programs currently being offered and enrollments in them; about new curriculums being planned; about techniques used in recruitment, testing, selection, and guidance practices; and about placement and follow-up procedures. A "pilot study" was done with two community colleges to refine the instrument, and then personal visits were made to all of Michigan's community colleges except Gogebic and Bay de Noc Community Colleges in the Upper Peninsula. The questionnaire was mailed to these two colleges because of time and travel limitations.

PROCEDURE USED IN SELECTING THE HIGH SCHOOLS INVOLVED IN THE STUDY

In an initial letter to the deans of the Michigan community colleges explaining the project, a request was made of them for a listing of the high schools from which each college received the majority of its students. Some of these lists were quite extensive so it became expedient to select a workable sample from these. The Michigan Education Directory was used to select those schools from the lists furnished by community colleges which had a medium-to-large* high school enrollment, and also to select schools representing good geographical coverage of the local community college attendance area. The left side of Table 2-1 shows the enrollment spread of this sample.

TABLE 2-1

ENROLLMENTS OF THE HIGH SCHOOLS INCLUDED IN THE STUDY WHICH RETURNED USEABLE QUESTIONNAIRES

"Classified"			"Unclassified"		
Enrollment	Number	(Approx.) Percent of Total Group	Enrollment	Number	(Approx.) Percent of Total Group
Under 500	4	4	Under 500	0	0
500 -1000	26	25	500 -1000	11	28
1000-1500	26	25	1000-1500	11	28
1500-2000	22	23	1500-2000	7	18
2000-2500	17	15	2000-2500	7	18
2500-3000	7	5	2500-3000	2	6
3000-3500	5	4	3000-3500	1	3
Over 3500	1	1	Over 3500	0	0
Total	109		Total	39	

This group, which will be referred to as the "classified high schools," included 136, of which 109 completed and returned the questionnaire. It appeared to the researchers that there was another group of high schools not in community college attendance areas which should be included in the study. This group, called the "unclassified high schools" for the purposes of the study, amounted to 46 schools with enrollments ranging from 500 to over 3000 students. Thirty nine of these returned the questionnaire. Many of the large high schools in this latter group are in the Detroit area and are not (officially) served by a community college.

The objective of the sampling procedure was to include high schools in each community college attendance area, and also to sample areas of the state not included in community college attendance areas. Table 2-1 also shows the enrollment distribution of the "unclassified high schools." One hundred forty-eight (148) useable questionnaires were returned, from high schools whose graduating classes (1963) included about 40,000 students or about 53 percent of the state's total of high school graduates for that year.

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*The schools finally included had enrollments of from 300 to 4000 students.

Summary and Concluding Note

So many different programs exist in the fields of technical education, with new specialties coming into being continuously, that much confusion exists. However, several national organizations, such as the Technical Institute Division of the American Society for Engineering Education, the Engineers' Council for Professional Development, and the American Association of Junior Colleges, are focusing public attention on this growing segment of the occupational structure and are attempting to clarify the misunderstandings that have existed up to the present.* Public recognition of technical education and training is gradually increasing. The technician occupations, that is, those lying between the skilled worker and the engineer or scientist, require post-high school levels of education and specialized training. "Technical education programs" in high schools are in fact a misnomer; but pre-technical curriculums in high schools have considerable promise. One purpose of the present study was to gather information to help clarify the meaning of technical education in Michigan.

The problem of recruiting sufficient members of high school graduates for technical programs in community colleges is presently compounded by such factors as inadequate prior preparation, inadequate counseling and guidance and occupational status perceptions held by high school students, their parents, and high school teachers. More effective coordination between the high schools, the local community colleges, and local industry is vital to the success of the total effort in technical education. An educational program will succeed first only to the extent that students enroll in it; and second to the extent that they can complete the curriculum and move on into gainful employment.

The findings of the present study will, it is hoped, lead eventually to the solution of some of the problems facing Michigan in the realm of technical education and middle level manpower utilization.

The next chapter presents the information obtained from the high school phase of the study.

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*See, for example:

a. The American Society for Engineering Education. Characteristics of Excellence in Engineering Education. James L. McGraw, Project Director, Urbana, Illinois: the Society, 1962.

b. Harris, Norman C., Technical Education in the Junior College. The American Association of Junior Colleges, Washington D.C., 1964.

CHAPTER III. ANALYSIS OF THE FINDINGS FROM THE HIGH SCHOOL SURVEY

WANTED

A "track" to prepare high school students for technical programs

WANTED

Seminars to acquaint counselors and high school faculty with middle manpower jobs

WANTED

Better articulation between--high schools--community colleges--industry--business--parents--students--

INTRODUCTION

One of the essential ingredients of secondary education is vocational guidance. The adequacy of vocational guidance services determines to a great extent the contribution which the high school can make to the future of youth. Education for what?—is a challenge frequently thrown at the public secondary schools by the society which supports them. For citizenship—yes; for worthy use of leisure time—yes; but most certainly also for worthy use of productive time; for an understanding of our economy and its occupational structure; and for an introduction to the skills and knowledge required for future occupational competence.

While all personnel in the high schools have some influence on the educational and vocational guidance of students, persons assigned as counselors have the direct responsibility of keeping abreast of current developments in the work-a-day world and, insofar as is possible, interpreting the changes which are likely to bring about new conditions to be faced by youth when they graduate. Therefore, the high school questionnaire for this study was devised to solicit information directly from counselors and directors of guidance. The following instructions were given on the questionnaire in order to clarify the two levels of technology with which the study was concerned:

> "Please feel free to give your professional opinions and ideas. Your identity and the name of your high school will not be revealed in any published report. All data and opinions will be used for statistical purposes only. This study deals only with semi-professional (engineering technologies) and highly-skilled (industrial technologies) offered as two-year, college-level, associate degree programs in public community colleges. ENGINEERING TECHNOLOGY is a broad term used to identify those occupational areas closest to the engineer; nearly, but not quite professional in status. This kind of technician requires a high level of theoretical knowledge with some manipulative "know how" and works in support of engineering activities at the research and design level. INDUSTRIAL TECHNOLOGY is a broad term used to identify those technical occupational areas nearer to the craftsman or skilled tradesman. These are highly-skilled occupations and require a modest background in science, mathematics, and technical theory. This kind of technician works in industrial jobs where the major emphasis is on production, maintenance, operation or testing."

The survey instrument consisted of nine pages comprising 41 items and was divided into these four major areas:

Part I - Some Statistics About the Students in 1963 Graduating Classes.

Part II - Some Information About the Counseling Services in High Schools.

Part III - Opinions and Perceptions of High School Guidance Personnel About Technician Programs in Michigan Community Colleges.

Part IV - Suggestions From Directors of Guidance for the Improvement of Guidance Services for Pre-Technical Students and for the Development of Technical Education.

Since the questionnaire was rather lengthy and was sent out at a very busy time of the school year, an 81.3 percent response is considered excellent, and is interpreted as evidence of considerable interest in the subject of technical education.

It will be observed that in some of the data presentation tables, the percentages do not add up to a total of 100 percent. The reason is that in some cases respondents did not answer all items. By and large, however, all respondents answered a major share of the items from each of the four parts of the questionnaire.

THE FINDINGS FROM PART I: SOME STATISTICS OF THE 1963 GRADUATING CLASSES IN SELECTED MICHIGAN HIGH SCHOOLS

Kinds of Curriculums now Offered by High Schools

In assessing the future aspirations of high school graduates, the kind of curriculum they followed while in high school is one indication of their intentions. Generally, those students who aspire to post-high school study or whose parents make this decision for them, select the traditional college preparatory curriculum. Several recent studies* have found that from 40 to 70 percent (depending on the location of the high school) of the high school population select this sequence of course work. It should be noted, however, that most four-year colleges and universities are admitting only those students who graduate in the top one-third of their high school class—indeed many colleges admit students only from the top 20 percent, and some use a 10 to 15 percent cutting point. The "C" average college preparatory high school graduates (comprising one-fourth to one-third of a graduating class) are finding it increasingly difficult to gain admission to baccalaureate degree-granting institutions. High school students who complete "general" or "vocational" curriculums are usually not admissible to four-year colleges at all, and (tragically) neither are they prepared for today's jobs, except for unskilled or casual employment.

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*See for example: The University of Michigan, Bureau of School Services, Citizens' Survey of Washtenaw County Community College Possibilities, Raymond J. Young, Director, Ann Arbor, Michigan: the University, July, 1963.

Questionnaires were returned from guidance directors of both public and private selected Michigan high schools representing 39,690 students of the 1963 graduating classes. The Digest of Educational Statistics* for 1964 reports that a total of 75,883 students were graduated from the public high schools of Michigan in June, 1963. This study then represents high schools which graduated over half the 1963 senior population, and the study findings can therefore probably be interpreted as being typical of the population of public high school seniors of 1963.

Table 3-1 summarizes the kinds of curriculums selected by the 1963 high school graduates, as reported by respondents.

TABLE 3-1

KINDS OF CURRICULUMS COMPLETED BY THE 1963 GRADUATES
IN SELECTED MICHIGAN HIGH SCHOOLS, AS REPORTED
BY DIRECTORS OF GUIDANCE OR HEAD COUNSELORS

Curriculum	Number	Percentage of Total Reported
College Preparatory	17,827	45
General	8,059	20
Vocational	5,164	13
Industrial Arts	3,144	8
Other	5,446	14
TOTAL GRADUATED	39,690	100

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*U.S. Department of Health, Education, and Welfare, Office of Education, Digest of Educational Statistics for 1964, Washington, D.C.: U.S. Government Printing Office, 1964.

Note that 45 percent of the graduates selected the college preparatory curriculum; the general curriculum was selected by 20 percent of the graduates; while 21 percent selected the vocational and/or industrial arts curriculums. Some schools indicated the offering of only the college preparatory and general curriculums. A sizable number of counselors, about 14 percent, indicated that students "tailored" their curriculums; that is, some high schools do not follow the use of traditional curriculums.

KINDS OF POST-HIGH SCHOOL EDUCATION CHOSEN BY 1963 GRADUATES

Information was also solicited on the number of 1963 graduates who subsequently enrolled in any kind of college program. Table 3-2 presents the findings.

TABLE 3-2

NUMBERS OF 1963 GRADUATES FROM SELECTED MICHIGAN HIGH SCHOOLS ENROLLING IN COLLEGE, BY KIND OF PROGRAM, AS REPORTED BY DIRECTORS OF GUIDANCE

Kind of Program	Number	Percentage of Total
Universities Four-Year Colleges Other Post-High School Institutions Excluding Community Colleges	10,116	26
Community College Occupational or Technical Program	3,950	10
Community College "Transfer" Program	3,691	9
TOTAL	17,757	45

It is significant to note that the percentage of graduates who were reported to have selected the community college transfer program is less than that reported to have selected the occupational or technical program. If actually true, this represents a changing pattern in community college enrollments. The figure of 45 percent of high school graduates going on to some kind of post-secondary educational program seems to be in keeping with state and national averages reported in other studies.*

THE FINDINGS FROM PART II: INFORMATION ABOUT COUNSELING SERVICES OF SELECTED MICHIGAN HIGH SCHOOLS, AS REPORTED BY DIRECTORS OF GUIDANCE

Since the guidance and counseling function has a most important role in assisting students to make decisions with regard to future educational or occupational plans, a series of questions was asked pertaining to this service. Both matters of fact and matters of opinion were elicited. The questions involved such items as student-counselor ratio, adequacy of career counseling, and rapport between the high school and the local community college.

Counseling is a time-consuming activity. Each student must be individually acquainted with the results of achievement, aptitude, and interest tests; and he must be given time to express and discuss his aspirations and goals. Often he is in a quandary, uncertain of his abilities and undecided about his future.

Counseling Time Assignments and Counselor Load

Directors of guidance and counselors responding reported their counseling time assignments as follows:

74 percent counseled full-time

11 percent counseled half-time

11 percent counseled quarter-time

On the question of average guidance time received by each senior, 73 percent of the respondents reported that on the average each student received one to two hours of counseling time during the year, while 27 percent indicated an allotment of from two to five hours. Eighty-nine percent of the respondents indicated that career counseling usually begins in the ninth or tenth grade in their schools.

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*See for example: The University of Michigan, Bureau of School Services; Citizens' Survey of Washtenaw County Community College Possibilities. Raymond J. Young, Director, Ann Arbor, Michigan: the University, July, 1963, p. 65.

Counselors' Perceptions of Adequacy of Career Guidance Programs

The counselors were asked, "How adequately do you feel your students are counseled in terms of career and occupational guidance?" Their opinions are summarized:

Response	Percent of Those Responding
Very Adequately	12
Adequately	57
Inadequately	30

In response to another question, 71 percent of the counselors responding indicated that they discuss two-year technical education programs and technical careers with the students only if the students ask about such post-high school programs.

Related to the question of career counseling was a question about work experience in industry, business, or health fields as being important in the overall preparation of high school counselors. The responses to this item indicated that only 18 percent of the respondents held the opinion that work experience of several years' duration was absolutely essential. Fifty-three percent thought it was important, but not as essential as college training in guidance, while 29 percent did not respond to this item at all.

Some open-ended comments written in by respondents to the question, "What steps could your high school take to improve guidance services for future technician students?" are worth noting at this point:

> "Place equal emphasis on technical training courses as on our college preparatory courses."
>
> "Counselors should learn more about the new vocations in the technician area."
>
> "Development of a guidance-oriented staff."
>
> "Workshops and in-service programs for counselors to help them become better informed about technical programs."

Availability of Career Guidance Information for Student Use

A certain percentage of students will seek information on their own if it is available. Others must have such information personally presented to them. Ninety-five percent of the respondents indicated that current and meaningful career guidance information was readily available at the high school for student use. Sixty-eight percent indicated that a "reading room" was available to students in the counseling office, while most of the remaining 32 percent indicated that guidance materials were available in the school library. Included in the career guidance files at most high schools are: the local community college catalogs (indicated by 99 percent); and brochures on semi-professional and technical programs (indicated by 86 percent of the respondents).

Standardized Tests Used in Counseling Programs

Standardized tests furnish information which may assist students to make educational and occupational choices consistent with their interests and aptitudes. Many different types of standardized tests were reported as being used, and those most frequently named are indicated in Table 3-3. Many of the respondents indicated that they used several tests, so the percent column of Table 3-3 obviously will not total 100.

TABLE 3-3

KINDS OF STANDARDIZED TESTS USED IN COUNSELING PROGRAMS AS REPORTED BY GUIDANCE DIRECTORS IN SELECTED MICHIGAN HIGH SCHOOLS

Abbreviation	Name, or Kind of Test	Percentage*
CEEB (SAT)	College Entrance Examination Board Scholastic Aptitude Test	85
ITED-4	Iowa Test of Educational Development-Ability to do Quantitative Thinking	85
PSAT	Physical Science Aptitude Test	82
DAT	Differential Aptitude Test	30
NMSQT	National Merit Scholastic Qualification Test	24
SCAT-V	School and College Ability Test-Verbal	22
SCAT-Q	School and College Ability Test-Quantitative	22
ITED-2	Iowa Test of Educational Development-General Background in the Natural Sciences	17
EPSAT	Engineering and Physical Science Aptitude Test	15

*Percentage of responding high schools using each test.

Articulation Between the High School Guidance Directors and Community College Personnel

The preparation of high school graduates for entry into and success in community college technical programs would seem to require an understanding of the content and arrangement of the college work, on the part of the high school counselor and/or teacher. It is well known for example, that all high school counselors and most high school teachers keep themselves very well informed on the requirements of universities and four-year colleges. The requirements of community college technical programs can be ascertained to some extent by a study of the college catalog, but a much better measure of the understanding of these programs would be evidence of a close working relationship (articulation) between high school counselors and community college personnel engaged in planning or instructing in technical programs.

The question, "How well do you know the following personnel in nearby community colleges?" was asked of the respondents. Their replies are summarized in Table 3-4.

TABLE 3-4

EXTENT OF ACQUAINTANCE BETWEEN THE DIRECTORS OF GUIDANCE OF HIGH SCHOOLS IN THE ATTENDANCE AREA OF THE LOCAL COMMUNITY COLLEGE, AND COMMUNITY COLLEGE PERSONNEL, AS PERCEIVED BY THE HIGH SCHOOL DIRECTORS OF GUIDANCE AND COUNSELING

Community College Personnel	Know Him Very Well	Know Him Fairly Well	Know Him Only by Name	Do Not Know Him at all
	(Percentage Reporting Each Response)			
Dean or President	34	27	14	20
Guidance Director	20	21	17	30
Placement Director	19	27	15	28
Dean/Director of Technical Programs	10	10	16	51
One or More Instructors in Each of the Following Areas:				
Chemistry	15	13	14	46
Electronics	15	11	13	50
Physics	13	9	11	56
Drafting	9	12	15	51
Mathematics	7	13	12	56
English	7	9	15	55
Social Studies	3	3	13	63
Health Fields	38	34	6	5
Computer Technology	19	13	11	48
Business Fields	12	11	11	51
Chemical Technology	11	11	8	56
Mechanical Technology	7	5	7	62
Civil Technology	3	9	11	60

Some respondents did not check this item at all, while some checked only certain portions of it. The response conclusively indicates that high school guidance personnel are not well acquainted with community college personnel, particularly in the area of technical education, and hence are unlikely to be very familiar with the actual requirements of technical education programs at the college. For example, 51 percent do not even know the identity of the director of the technical program. Even worse, 30 percent do not know the college guidance director, a person who is in the same professional field as the respondents!

No inference about "where the fault lies" is to be read into these data. High school counselors are busy people, and so are community college personnel, but immediate steps should be taken by all concerned to effect better liaison than is indicated in Table 3-4. Although the key areas for improved liaison are at the administrative level (director of technical education and director of guidance), definite efforts should also be made to acquaint high school guidance personnel with community college instructors in the several technical fields offered at the local college.

Specific Ways the Local Community College Could be of Assistance to High Schools in Counseling Students

Pertinent to the previously discussed problem of rapport between high school counselors and community college personnel are these comments as suggested by the high school guidance directors in responding to the following question:

> "In what specific ways could the local community college be of greater assistance to you in counseling students whose future educational and career plans probably do not include graduation from a four-year college?"

Eighty-seven percent of the respondents gave one or more comments. A large sampling of these write-in comments is included in Appendix D, but a few are presented here, as they relate to the liaison problem.

> "Come out to the local schools."

> "Increase efforts to keep high schools informed as to progress of its graduates."

> "Visit high school to provide counselors with information on kind of student you will accept, probability of success, etc. Talk with prospective students in various areas. List courses student should take in high school to prepare for study in community colleges."

"Offer clinics for counselors where specific technical programs could be explained and discussed. On a small group basis if possible. If we counselors became more aware of technical training and had better knowledge of the programs, I'm sure that our students would benefit."

These comments indicate the general tone of all the comments made on this item, with perhaps the most frequent remark being that more publicity and information about community college activities and kinds of programs offered, be passed on to the high schools.

On the positive side, several counselors remarked that they had a good working relationship as typified by this comment: "We always receive immediate help from the college." This is a two-way street however, and the same kind of persistent effort must be made by high schools to obtain information about community colleges as has traditionally been put forth to obtain information about baccalaureate degree-granting institutions.

THE FINDINGS FROM PART III: OPINIONS AND PERCEPTIONS ABOUT ENGINEERING AND INDUSTRIAL TECHNICIAN PROGRAMS IN COMMUNITY COLLEGES, AS EXPRESSED BY DIRECTORS OF GUIDANCE IN SELECTED MICHIGAN HIGH SCHOOLS

This portion of the questionnaire sought to ascertain the extent of the high school counselors' knowledge and opinions about community college educational programs for the semi-professional and highly-skilled technical occupations. Questions were designed to seek out their opinions on the proper high school preparation for entry into collegiate-technical work; the typical subjects which ought to be required in high school; the student's approximate minimum standing in his high school graduating class; and most important, the counselors' rating of items for inclusion in a possible "pre-technical" high school curriculum. The counselors were asked to observe the following instructions: "In this section, please check the following questions as best you can on the basis of your present knowledge or opinion without 'researching' or looking up the answers."

High School Preparation Desirable for Community College Technical Education Programs, as Perceived by Directors of Selected Michigan High Schools

The directors of guidance were asked to select the one of three typical high school curriculums which, in their opinion, would constitute the best preparation for a college level technical education program. This question related to curriculums now offered in most high schools. The results are summarized in Table 3-5.

TABLE 3-5

RELATIVE SUITABILITY OF THREE TYPICAL HIGH SCHOOL CURRICULUMS FOR PREPARATION OF HIGH SCHOOL STUDENTS FOR COMMUNITY COLLEGE TECHNICAL EDUCATION PROGRAMS, AS RATED BY HIGH SCHOOL DIRECTORS OF GUIDANCE

Percentage of Respondents Selecting each Curriculum		
3%	85%	8%
Curriculum A	Curriculum B	Curriculum C
3 yrs. mathematics	3 yrs. mathematics	1 yr. mathematics
3 yrs. English	3 yrs. English	3 yrs. English
2 yrs. lab. science	1 yr. physics or chemistry	1 yr. social science
3 yrs. social science	2 yrs. social science	1 yr. general shop, or
3 yrs. foreign language	2 yrs. drafting	1 yr. wood shop
electives	1 yr. general shop	1 yr. mechanical drawing
	electives	2 yrs. machine shop, or 2 yrs. auto shop
		electives

It is significant to note that of the three possible choices, Curriculum B, which is basically a "college prep" track, but includes some drafting and general shop, was chosen by 85% of the directors of guidance. Curriculum A is college preparatory without any "practical" work, while "C" is a rather typical vocational-industrial track. It would appear that high school directors of guidance realize that the typical vocational-industrial or industrial arts curriculum in high school does not constitute good preparation for community college technical education study, and that the typical college-prep track is not suitable either.

The Technical Institute Division of the American Society for Engineering Education, in structuring the content of college-level engineering technician programs, suggests that the entering student should present the following minimum high school preparation: three units in English, two units in algebra, additional units in geometry and/or trigonometry, one (or two) units in physical science, two units in mechanical drawing, and one unit in general shop, along with social sciences and electives to complete high school graduation.*

It is interesting to note that Curriculum B, chosen by 85 percent of the high school counselors, agrees rather closely with the ASEE statement.

High School Courses Deemed Necessary for Entry into Engineering Technician Programs at Community Colleges

As a check on the prior question, that is the query asking for a rating of typical high school curriculums, counselors were asked to indicate their ideas as to the kinds of high school courses which students should take if they desire later entry into engineering technician programs. The tabulation of their responses is presented in Table 3-6. They were asked to check as

TABLE 3-6

HIGH SCHOOL COURSES NEEDED FOR ENTRY INTO ENGINEERING TECHNICIAN PROGRAMS IN COMMUNITY COLLEGES, AS PERCEIVED BY COUNSELORS OF SELECTED MICHIGAN HIGH SCHOOLS

Needed High School Courses	Percentage of Counselors Checking The Subject	Needed High School Courses	Percentage of Counselors Checking The Subject
Algebra	82	Chemistry	36
English	73	Machine Shop	19
Geometry	73	Electricity	7
Mechanical Drawing	56	Typing	1
Physics	51	Auto Shop	1
Trigonometry	39	Wood Shop	1

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*The American Society for Engineering Education, Characteristics of Excellence in Engineering Technology Education, James L. McGraw, Project Director. Urbana, Ill.: the Society, 1962, p. 13.

many of the high school subjects as they thought were essential to later entry into a collegiate-technical program.

A significant number did not respond to any of the items, which fact could imply a lack of understanding of the requirements for collegiate-technical studies on the part of the non-respondents. The majority of the counselors did however, select four subject matter areas (English, mathematics, physics, drafting) which community college and technical institute programs pre-suppose. It is difficult to understand why only 73 percent felt that the high school English was a necessary pre-requisite to community college technical curriculums. Only one respondent in five felt that machine shop was needed, and this shows a lack of understanding of the skill requirements for the technical education program.

Percentile Rank in High School Graduating Class Desired for Aspirants to Collegiate-Technical Programs

Admission policies in Michigan community colleges generally subscribe to the "open-door" philosophy, which means that any high school graduate, or a person with equivalent preparation; or any adult who can "profit from the instruction," can be admitted. However, such admission to the college does not mean automatic admission to any curriculum the student desires. Admission to specific curriculums is based on the interest and achievement factors which indicate probable success in that curriculum. Rather extensive counseling and guidance procedures are used to assist the student in making choices of courses and curriculum. Students who are inadequately prepared may be required to take certain "repair" courses and to attain specified grade point averages in preliminary work before they are allowed to enter the basic courses of a technical curriculum. Since collegiate-technical programs are mathematics-and science-oriented, college admissions officers and high school guidance counselors should plan together to see that the high school preparation of future technician students reflects this emphasis. And, since drafting skills and basic shop skills are also highly desirable, provision for these courses should also be a part of this planning effort.

One of the best measures of predicting the success of entering technician students is their rank in the high school graduating class. Two questions were framed to test counselors' perceptions about this item. Table 3-7 presents a compilation of counselors' perceptions on the percentile ranking of high school students as the ranking might relate to future success in both levels of technical education in community college.

TABLE 3-7

PERCENTILE RANKING NEEDED BY HIGH SCHOOL GRADUATES DESIRING TO ENROLL IN COMMUNITY COLLEGE TECHNICIAN PROGRAMS, AS PERCEIVED BY THE DIRECTORS OF GUIDANCE OF SELECTED MICHIGAN HIGH SCHOOLS

Engineering Technician Program		Industrial Technician Program	
High School Rank In Graduating Class	Percentage of Counselors Checking	High School Rank In Graduating Class	Percentage of Counselors Checking
80th %ile	3	80th %ile	2
70th %ile	20	70th %ile	5
60th %ile	22	60th %ile	17
50th %ile	34	50th %ile	40
40th %ile	12	40th %ile	21
30th %ile	4	30th %ile	9
No Response	5	No Response	5

For the semi-professional or engineering technician level, 76 percent of the counselors feel that students should be between the 50th and 70th percentiles (inclusive) of their high school graduating class which agrees with a recent study* on this topic. For the highly skilled or industrial technician level programs, 70 percent of the counselors felt that the class standing of a high school graduate could range from the 50th down to the 30th percentile and still indicate success for the student concerned. This perception is in fairly close agreement with experience from community colleges operating typical programs at the industrial technician level.

In summary, it appears that about 70 percent of the high school guidance directors are reasonably well informed about the high school performance necessary for predicting future success in both the "engineering" and "highly-skilled" levels of technical education as offered in community colleges.

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*Greenwood, R. Leroy, "Predicting Success in Technical Programs" Technical Education News, 23:22-23 December, 1963.

High School Curriculum Which Best Prepares a Student for a Collegiate-Technical Program

As a check on the counselors' opinions of what kind of high school preparation is usually required for entry into and success in technical programs, as reported in Tables 3-5 and 3-6, the respondents were asked to select the currently offered high school curriculum which they considered the best preparation now available in their high school for a community college technical education program. Four typical high school curriculums were listed. The respondents' selections are compiled in Table 3-8.

TABLE 3-8

COUNSELORS' CHOICES OF CURRENTLY OFFERED HIGH SCHOOL CURRICULUMS GIVING PREPARATION FOR A COMMUNITY COLLEGE TECHNICAL EDUCATION PROGRAM

Currently Offered High School Curriculums	Percent of Counselors Selecting the Program
College Preparatory	51
Vocational-Industrial	18
General	16
Other (this group indicated "custon" curriculums)	12
Business	0
No Response	3
Total	100

Over half of the counselors and guidance directors chose the college preparatory course, which at present seems to them to be the best choice of high school curriculum for a student aspiring to a technical education program in a community college. The first seven courses in the listing of Table 3-6 would be, for the most part, in the college preparatory sequence so these two sets of responses are quite consistent. It is emphasized that a forced choice was elicited here. Of presently offered high school curriculums, the college preparatory track is thought to be the best by high school counselors.

Methods of Increasing the Awareness of High School Students About the Career Possibilities in Technician Occupations

Counselors are in a most unique position to appraise the general attitude and career expectations of high school students, so a question was designed to seek the opinions of directors of guidance and counseling as to what can be done to make the technician occupations more "popular" with high school students as they consider future careers. Each item as shown in Table 3-9 was to be checked on the basis of being "extremely important," "important" or "of little importance."

TABLE 3-9

COUNSELORS' OPINIONS OF METHODS WHICH MIGHT BE USED TO INCREASE THE AWARENESS OF HIGH SCHOOL STUDENTS WITH RESPECT TO CAREER OPPORTUNITIES IN THE TECHNICAL OCCUPATIONS

Techniques to be Used	Counselors' Ratings (in Percentages)			
	Extremely Important	Important	of Little Importance	Total % Responding
More and better career information to students	65	24	1	90
More information to parents	56	30	3	89
Better publicity in general news media	53	32	7	92
Better facilities for technical programs at the community colleges	42	38	3	83
Clearer understanding of high school preparation required	32	46	6	84
More and better placement of graduates of technical programs	26	49	5	80

Here again is a verification of the hypothesis that students are poorly informed about the technician occupations as possible career choices, which assumption was one of the purposes prompting the study. The item which 65 percent of the guidance directors perceived to be extremely important was "more and better information to students." Together with the 24 percent who checked it as being "important" a total of 89 percent felt that a wider dissemination of information to students is essential. "More information to parents" ranked a close second with a two column total of 86 percent, and over half checked it as being "extremely important." "Increasing the public image of technicians through publicity in general new media," ranked third in importance for a two-column total of 85 percent, with over half of the counselors indicating it as being "extremely important." Eighty percent felt "better facilities for technical programs at community colleges" were needed. Significantly, 78 percent noted that a clearer understanding of the high school preparation needed would be helpful.

To summarize this item, about 80 percent of the selected high school counselors surveyed perceived the problem of increasing students' awareness of career possibilities in technical occupations as being one of a lack of communication. Industry must tell its needs to the public and the community colleges, and the community college must communicate effectively with the local high schools, with its prospective students, and with their parents. It is paradoxical that, in an era of vast technological advances, particularly in the field of mass media communications, a lack of basic information is considered to be the biggest single obstacle to the recruitment of needed technical manpower.

Guidance Directors' Opinions and Observations of Needed Items to Include in a "Pre-Technical" Curriculum

One of the major purposes of the high school phase of the study was to gather opinions from high school counselors as to the desirability of a "pre-technical" curriculum in high schools, and to obtain their suggestions for items to include in such a pre-technical "track."

The counselors were asked to rate typical high school subjects, as well as items related to counseling, at three levels of importance for inclusion in a "pre-technical" program. The question was phased as follow: "In your opinion, and drawing on your observations, how would you rate each of the following items for inclusion in a "pre-technical" curriculum for those high school students aspiring to enroll in two-year collegiate-level technology curriculums?"

The replies are summarized in Table 3-10.

TABLE 3-10

RATINGS OF ITEMS TO INCLUDE IN A "PRE-TECHNICAL" CURRICULUM, AS PERCEIVED BY GUIDANCE DIRECTORS IN SELECTED MICHIGAN HIGH SCHOOLS

ITEMS	(Column Entries are Percents of Those Responding to Each Item)				
	(1) Extremely Important	(2) Fairly Important	(3) Totals (1 & 2)	(4) Little or no Importance	Total Response for Each Item
Acedemic Courses					
English (communication skills)	75	20	95	0	95
Algebra—2 units	78	16	94	1	95
Geometry—1 unit	74	18	92	1	93
Physics with lab—1 unit	43	43	86	3	89
Trigonometry—1/2 unit	42	43	85	7	92
Chemistry with lab—1 unit	34	49	83	5	88
Social Studies	17	64	81	11	92
"New physics" sequence (PSSC)	16	38	54	21	75
"New mathematics" sequence (SMSG)	36	32	68	17	85
Shop mathematics—1 unit	28	33	61	24	85
Biology—1 unit	14	42	56	31	87
Foreign language—1 unit	0	16	16	72	88
Supporting Technical and Shop Courses					
Drafting—1 unit	71	20	91	2	93
Ind.Arts electrical shop—1 unit	22	50	72	16	88
Ind.Arts metal shop—1 unit	18	50	68	22	90
Vocational machine shop—2 units	16	52	68	18	86
Vocational electricity—2 units	15	49	64	20	84
Ind.Arts wood shop—1 unit	9	46	55	35	90
Auto shop—1 unit	6	38	44	38	82
Guidance Services					
Adequate occupational information service	84	9	93	0	93
Adequate counseling	84	8	92	1	93
Aptitude testing	58	30	88	3	91

The results of this compilation (see column 3) have a direct correlation with Tables 3-5 and 3-6. Table 3-5 (85 percent choice of Curriculum B) indicated that most counselors felt an adequate pre-technician curriculum should include three years of mathematics, three years ofEnglish, two years of drafting and social studies one year of physics or chemistry, and one year of general shop, in addition to electives. These are the courses which are rated highest for inclusion in a pre-technical curriculum in Table 3-10. The percentage of counselors checking English, algebra, geometry, trigonometry, physics, and chemistry as being extremely important for inclusion in a pre-technician track, (Table 3-10) agreed closely with the findings presented in Table 3-6.

There seems to be a good measure of agreement among high school guidance directors as to the basic or core courses necessary for a "pre-technical" curriculum. These are English, algebra, geometry, trigonometry, physics with laboratory (or chemistry with laboratory), and drafting. "Social studies" also ranked high in their choices, but this may be merely because of a high school graduation requirement. There is recognition also that future technical students need some kind of high school shop experience, since the Column 3 totals (Table 3-10) for three of the shop areas (metal, electrical, machine) were over 60 percent.

High school counselors seem to be aware of the shortcomings of the "new physics" (PSSC) and the "new mathematics" (SMSG) in relation to their applicability to pre-technician curriculums. Column 3 totals for these courses are significantly lower than the ratings given "standard" courses in physics and mathematics, where laboratory work and practical applications are emphasized.

It is disquieting to note that even the counselors themselves do not all perceive adequate occupational information and adequate counseling as being "extremely important" and that in both these items 7 percent failed even to make a comment. Aptitude testing was deemed as being either extremely important or fairly important by 88 percent of the respondents.

THE FINDINGS FROM PART IV: SUGGESTIONS FROM DIRECTORS OF GUIDANCE IN SELECTED MICHIGAN HIGH SCHOOLS FOR THE IMPROVEMENT OF GUIDANCE SERVICES FOR PRE-TECHNICAL STUDENTS

In addition to the more-or-less structured responses asked for in the previous three parts of the questionnaire, it was felt that free responses would generate many helpful suggestions. The instructions for this part of the questionnaire indicated the extreme importance of solicited comments and stressed the value of the counselors' suggestions for future planning. Some 1500 individual comments were advanced in answer to four general questions on technician education problems. Many of the kinds of comments were repeatedly mentioned, which of course adds validity to the ideas expressed. A large sampling of the comments to each of these questions is included in Appendix D, with the most frequently mentioned responses being summarized here for each item of Part IV.

Steps High Schools Could Take to Improve Guidance Services for Future Technician Students, as Perceived by Guidance Directors in Selected Michigan High Schools

Realizing that counselors are on the "front line" with respect to students' problems and career decision making, this question was posed: "What steps could your high school take to improve guidance services for future technician students?" Ninety-three percent of those returning the questionnaire included free responses to this question. A large sampling of comments was selected as being most typical and these are all included in Appendix D. A brief sampling of the comments is included here:

"Learn more about the college offereings."

"In-service training to counselors."

"Educate counselors as to requirements and aims of the program."

"Practical counselors...devoted to their role as counselor."

"Have trained vocational counselors and more information about technical programs."

"Train counselors in the importance of the program."

"Tradition and background void most counselors for the role of vocational counseling."

"We could seek out the information—assume all the responsibility, but I doubt if we would. It has to be a cooperative venture. After completing this questionnaire I feel it a must to get more information."

Several respondents mentioned publicity and visitation as aid in increasing awareness of career opportunities. These comments point to a very pressing need which could be easily remedied; as suggested by the following comments:

"Provide opportunity for interested students to talk with technicians on the job, and with technician students."

"Career seminars—one week, using local people—also sending a newsletter to parents, including mostly terminal and technical information, courses, etc."

"Visit the community colleges to see the programs in action."

"Assemblies for giving information to students."

"Bulletin board displays—career day—technical center open house."

"We need a reading room to display information so students can come and use the material."

To summarize, the comments pointed to the following needed improvements in guidance services for future technician students.

1. About one-third of the counselors point out a need for an internship or seminar series for orienting high school counselors and teachers to the acedemic needs of those aspiring to become technicians.

2. A significant number of the respondents indicated a need for instituting pre-technical programs and a need for identifying pre-technical students earlier in their high school careers.

3. About one-third of the respondents reported a shortage of counseling time and a need for a lower pupil-counselor ratio in the earlier grades. The desirability of beginning vocational counseling in junior high school was mentioned often. Indicated also was a shortage of proper counseling facilitites, such as rooms providing for privacy in counseling.

4. Establishment of rapport between high school personnel and community college personnel is essential. This coordination was deemed especially necessary in the science, mathematics, English and technical subject areas.

Anticipated Curriculum Revisions and/or New Curriculums Being Planned for Pre-Technician Study

Ninety-three percent of those surveyed in the study commented on this item with about 20 percent responding that nothing currently was being done or planned for pre-technician education. Over 70 percent had some positive comment, however. The question was phrased as follows: "Do you anticipate any curriculum revisions and/or new curriculums in your high school for pre-technician studies?"

A sampling of the replies is collected here:

"Yes—electronics, basic math, including trig, algebra, and geometry on practical level."

"We are striving to broaden our industrial arts programs to include separate classes for technical-bound students in drafting, electricity, machine shop, auto mechanics, etc."

"Electronics" (stressed by many respondents).

"Physics and algebra for vocational-oriented students as well as college prep students."

"We might modify some science and mathematics courses to meet the needs of the "middle third," if we had some assurance that they would be successful in technical programs."

"We have had curriculum revisions for the pre-technician program and I hope we will continue to have more revision."

Some counselors talked about expanding "shop math" and "industrial arts" programs and it is apparent from such comments that there are serious misconceptions in some high schools about the level of pre-technical course needs. There appears to be a tendency on the part of a few counselors (judging from the wording of the free-response comments) to lump all non-college prep tracks (i.e. vocational-industrial, industrial arts, pre-technical) together, as regards the kind of practical shop and drafting work required. The same confusion seems to exist with regard to mathematics and science, in the minds of some counselors. A few of the respondents seemed to feel that shop math, general science, and standard high school shop courses constitute preparation for collegiate-technical programs. However, most of the respondents did seem to understand the kind of revisions and additions needed for a "pre-technical" curriculum. A larger sampling of these comments is included in Appendix D.

Methods of Improving the Image of the Semi-Professional and Technical Occupations

Eighty-nine percent of the guidance directors responded to the question: "How can the image of the semi-professional and technical occupations be improved?" Many worthwhile suggestions were offered which could be implemented immediately. The essential idea advanced by the majority of the respondents sampled is that extensive publicity is needed if the image of the technical occupations is to be changed so that large numbers of youth will give serious consideration to this occupational area. Typical comments were:

"Public relations efforts by companies and colleges."

"Contacts with parents and students by successful individuals within the field. Comprehensive high schools—serving entire community."

"Give the students an opportunity to hear from people who are happy and successful in the semi-professional field." (the tone of this response was indicated by many of the counselors)

"A good selling or public relations job. Get off the 'engineering and scientist kick' and sell the technician programs."

"We need a community college in this area that offers such programs." (Many high schools are still not served by community colleges and some of the community colleges are not doing very much in technical education.)

"Somehow impress upon parents the idea that not all people should be four-year college graduates." (This kind of response was frequently mentioned.)

"Parents, teachers, and school administrators must first change their attitudes toward these occupations before we can expect to have the image elevated in the eyes of your young people." (This idea was implied by many of the comments.)

In summary, the counselors offered many possible and practical solutions to improve the "image" of the technical occupations. The central tendency of the opinions is that educational forces must cooperate with industry, and jointly attack the "image" problem. A larger sampling of responses from this question is included in Appendix D.

Needed Services Which Michigan Community Colleges Might Render to High Schools in Their Attendance Areas to Promote Technician Education

Eighty-five percent of the counselors responded to this item. The major service the community college could give to high schools, according to the high school guidance directors is in the realm of providing information. Clear statements of programs offered; attractive folders about the technical occupations and technical training programs; information about admissions requirements and desired high school preparation—all should be made available to the high school for posting and distribution. Publicity to students, parents, and the public in general should be initiated by the community college through the various general news media. Also mentioned quite frequently was a need for community college consultants to work in close liaison with high school teachers and counselors. The following comments summarize the general consensus:

> "I honestly feel the community colleges should have specific days where they invite high school counselors to visit the college. This invitation should be sent to the principal urging the principal to send all his counselors. The principal should be included also." (affirmed by many respondents)
>
> "Make their programs known to students, parents, educators and industry." (A very frequent comment.)
>
> "Introduction of pre-technical programs in high schools."
>
> "More publicity needed to high schools. More publicity needed to inform people of new trends. More counseling service." (emphasized by many of the respondents)

SUMMARY OF THE HIGH SCHOOL PHASE OF THE STUDY

A brief résumé of some of the major findings of the high school survey is presented here.

1. Of the 182 questionnaires sent to directors of guidance of selected Michigan high schools in May, 1964, 148 useable replies were received for an 81.3 percent return. This group included high schools whose student population ranged from 300 to over 3,000; schools which represented 39,690 graduates of the 1963 senior classes in Michigan—over 50% of the high school graduates of that year.

2. Approximately 17,900 or 45 percent of the 1963 graduates, followed the college preparatory curriculum, with about 17,750 going on to some kind of post-high school education (colleges, junior colleges, technical schools, business colleges, etc.)

3. Rapport between high school counselors and local community college personnel is judged to be rather poor; 30 percent of the respondents did not know the college guidance director, and 54 percent did not know the director of the technical programs. Very few high school counselors knew the subject area teachers in the community college technician programs.

4. About three-fourths of the counselors gave responses which indicate that they have some knowledge about the necessary high school preparation for collegiate technical work. They also are knowledgeable about the caliber of high school performance required; with 76 percent agreeing that a student

should range between the 50th and 70th percentiles of his high school graduating class for the "engineering technician" program; and 70 percent indicating that the student should range between the 50th and 30th percentiles of his graduating class in order to predict success in the industrial technician program.

5. Over 85 percent of the counselors selected an "optimum" grouping of academic courses and shop courses presently offered in the high schools which would give adequate preparation to a technician aspirant. By "optimum" here is meant that their selection agrees with that recommended by studies made in recent years by such agencies as the U.S. Office of Education, the Technical Institute Division of the American Society for Engineering Education, and the American Association of Junior Colleges.

6. A majority of the high school guidance directors responding seemed to agree with a point of view held by most college-level technical educators—that neither the "vocational track" nor the "college prep track," as currently and typically offered in high schools, is really suitable for the preparation of future technician students.

7. The lack of a "status image" for technical education and for the technical occupations, was identified by the respondents as being a serious problem, on which a concerted attack should be made, with industry-education cooperation. This "status" problem is made all the more serious by the neglect of high school counselors to "mention" the technical occupations as possible career choices. Seventy-one percent of the respondents indicated that technical education and the technical occupations as careers are discussed with students only if the students ask about such programs and jobs.

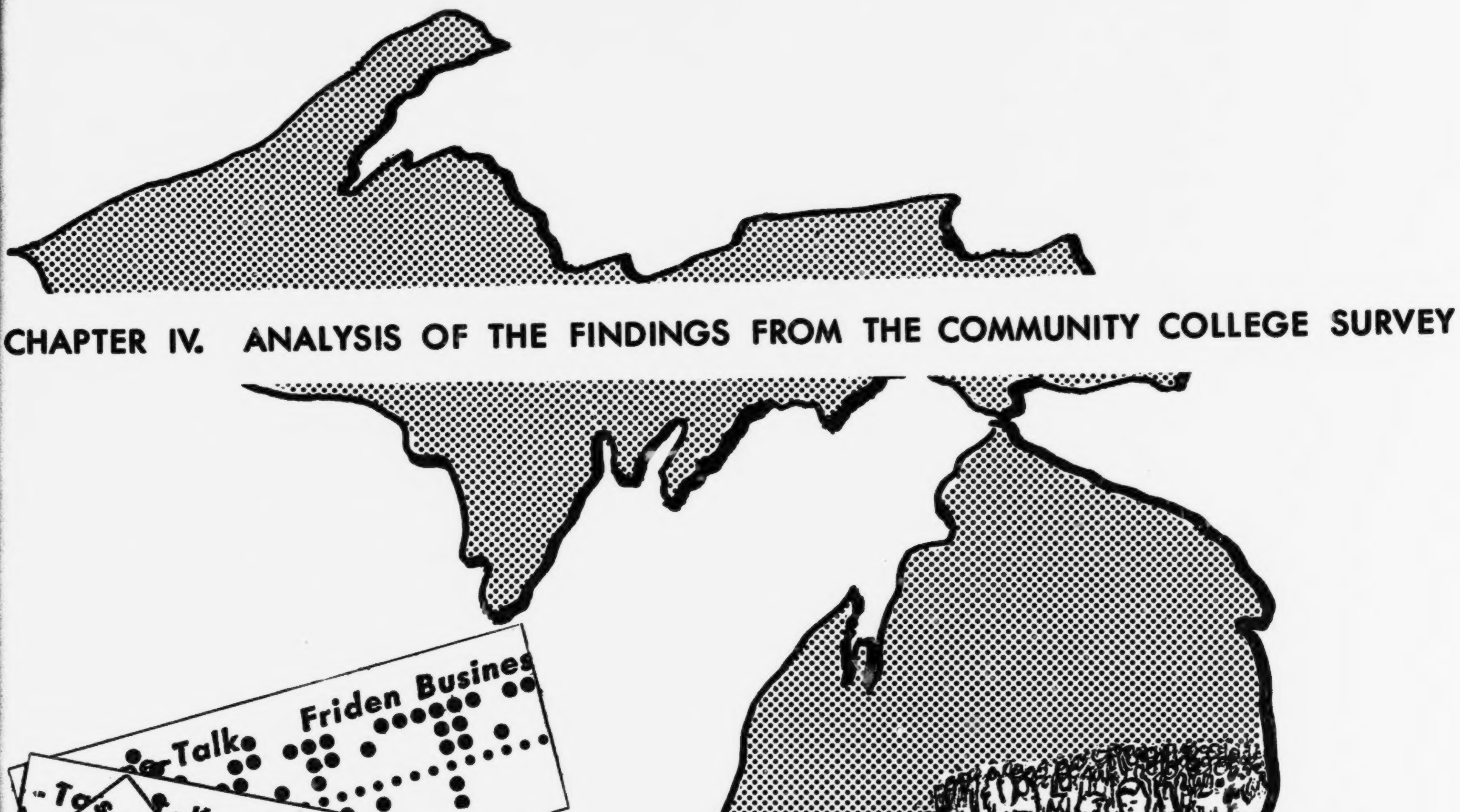
8. High school guidance directors feel that most community colleges should be making a much greater effort than they now are making to publicize their technical education programs and the technical occupations. High school personnel would welcome much more information from and communication with community colleges.

9. High school guidance counselors were generally in favor of the idea of a "pre-technical" track. Some 70 percent of the respondents indicated (in the free response section) that their school was already giving some attention to the problem of developing a "fourth track" for "the middle third" of high school students.

10. There was a considerable measure of agreement (at about the 85 percent level) that a suitable high school pre-technical curriculum (four-year basis) might include:

English (not "accelerated")	3 units
Mathematics (algebra, geometry, trigonometry/or intermediate algebra—not SMSG mathematics)	3 units
Physics with laboratory (not PSSC physics)	1 unit
Drafting	2 units
Basic Shop	1 unit
Social Studies	2 units
Electives (additional mathematics, science, shop, drafting)	4 units

CHAPTER IV. ANALYSIS OF THE FINDINGS FROM THE COMMUNITY COLLEGE SURVEY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----Community college programs preparing for middle manpower jobs in industry:

Electrical Technology--Electronics--Industrial Technology--Welding Technology--Technical Sales--Tool and Die Design Technology--Mechanical Technology--Engineering Technology--Technical Writing--Automotive Technology--Chemical Technology--Computer Programming--Drafting and Design Technology--Instrumentation Technology--Air Conditioning, Heating, and Refrigeration Technology--

INTRODUCTION

Specific information on the status of technical education programs in the public community colleges of Michigan has been rather limited.* This is due in part to the relative "newness" of technical education in Michigan's community colleges, of which only twelve institutions have had programs in operation over the past five to ten years. Also, the recognition of the technician as a necessary component of the work force is just beginning to gain momentum statewide.**

One purpose of the community college phase of the study was to gather factual information on technician programs offered and on enrollments in these programs during the 1963-64 college term. Two levels of educational programs were identified—*the engineering technologies* and the *highly skilled (industrial) technologies*. The definitions given on page 13 of this report were supplied to the community college respondents to assist them in "placing" the programs they are offering.

Information on new programs being planned, on content distribution within the curriculums; and on recruitment, selection, guidance, and placement practices was also solicited.

The procedure used in gathering the information from community colleges was described in Chapter II. The community colleges participating in the study are listed in Appendix A.

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*See for example the following:

Brandon, George L, *Twin Cities Technicians*, East Lansing, Michigan: Michigan State University, College of Education, Department of Vocational Education, January, 1958.

Smith, Harold T., *Education and Training for the World of Work*, A Vocational Education Program for the State of Michigan, Kalamazoo, Michigan: The W. E. Upjohn Institute for Employment Research, 1963.

**See *Proceedings of the Technician Manpower Conference*, a report of a conference held at The University of Michigan, Dearborn Center, under the auspices of the Executive Office of the President of the U.S., Office of Emergency Planning, May, 1963.

PART I. INFORMATION ON TECHNICIAN CURRICULUMS OFFERED

Enrollments by Level of Program

The respondents were asked to categorize their technician programs as either engineering technology level, or industrial technology level, using the definitions given on page 13, and then report on the enrollments in all majors at each level for the years 1961, 1962, and 1963. The results are tabulated in Table 4-1.

TABLE 4-1

STUDENTS ENROLLED IN ENGINEERING AND INDUSTRIAL TECHNOLOGIES AS REPORTED BY OFFICIALS OF TWELVE MICHIGAN COMMUNITY COLLEGES*

Levels	1961	1962	1963
Engineering technologies	90	338	479
Highly skilled technologies	826	951	1158
Totals	916	1289	1637

While these enrollment figures indicate a healthy growth over the past three years, the total of 1637 enrollments in technician curriculums, when compared with the approximately 39,000 total community college enrollments in 1963, leaves much to be desired. A recent report of the Michigan Council of Community College Administrators** indicated an enrollment of 13,700 students in organized occupational curriculums, of which about 6,000 were full time day students.

It would appear that, even among occupation-centered curriculums, technical education of the kind and levels covered in this study is attracting only about one student in every eight or nine. The others are distributed among business, clerical, trade and industrial, and public service occupational programs.

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*Only twelve institutions, as of June, 1964, could clearly indicate that they were operating technician programs at the levels defined by the study.

**50 Years of Community College Service to the People of Michigan, MCCCA, 1964; Philip J. Gannon, President, Lansing.

Discussions with cognizant officials in the community colleges brought out the fact that attrition rates are quite high in technical programs. Exact information on total numbers of actual graduates (i.e. those students awarded an associate degree) was not available, but a consensus among deans and directors of the colleges indicated that only about two students out of ten who enter a technical curriculum actually complete associate degree requirements. Several reasons were identified for this low retention rate:

1. Ready availability of well-paid jobs for the partially trained technician.

2. Financial need (real or fancied) on the part of many students.

3. Transfer to trade-level programs leading to apprenticeable occupations.

4. Occasional transfer to pre-engineering curriculums.

5. Academic rigor of the technician program.

6. Lack of proper preparation in mathematics, science, and English.

The problem of low initial enrollments was discussed at length with community college officials. They identified the major barriers to increased enrollments as follows:

1. Inadequate career counseling in high schools for the middle level student. These students are not made aware of the attractive career opportunities in semi-professional and technical fields.

2. The absence of a proper kind of high school curriculum, specifically designed to prepare students for entry into collegiate-technical programs of study.

3. The relatively poor status image of "less-than-baccalaureate-degree" programs in our society, and the lack of recognition by Michigan industry of the two-year technical graduate. The latter factor is gradually improving however, according to some of the college officials interviewed.

The question of women students in technician programs was brought up for discussion. Fewer than 20 women were reported as being enrolled in such programs. These were in drafting, chemical, and data processing technologies. The neglected opportunity here is almost tragic, for there are many excellent technical jobs for women in these rapidly expanding occupational fields.

Enrollments by Kind of Program

Data were obtained on the numbers of students enrolled in several different kinds of technology programs offered in Michigan's community colleges. The results are shown in Table 4-2. Both levels (i.e., engineering technology and highly skilled technology) are included in the totals.

TABLE 4-2

ENROLLMENTS IN TECHNICAL CURRICULUMS OFFERED BY MICHIGAN COMMUNITY COLLEGES, COLLEGE YEAR 1963-64

Technology	Number Enrolled
Electrical/Electronic	479
Drafting-Design	450
Mechanical	145
Industrial	127
Automotive	103
Civil	88
Data Processing	62
Metallurgical	31
Chemical	24
Tool Design	20
Architectural Drafting	5
Miscellaneous	103
Total	1637

The popularity of the electrical/electronics field is a reflection of national trends rather than local needs, since Michigan has very little in the way of an electronics or electrical manufacturing industry. However, it is well known that qualified graduates of electronics technician programs find good jobs, frequently in communications, aero-space, missile, and other "glamor" fields. Electronics technology has been publicized far more widely than has any other technical field.

Drafting and design is an important technological field in Michigan's economy, as are the next three on the list—mechanical, industrial, and automotive technologies. Several times the numbers of students here reported could probably be placed in good jobs in Michigan industries each year, upon completion of an associate degree technician program.

Data processing technology and chemical technology are relatively new fields for Michigan community colleges. There are many job opportunities available for graduates however, and the college officials interviewed felt that new programs in these two technologies should be initiated in several community colleges.

It is difficult to understand the very low enrollment reported in architectural drafting. In a growth state like Michigan, where the building construction industry is enjoying a healthy boom, it would seem logical that architects, engineers, and contractors could use scores of newly qualified architectural draftsmen each year. The enrollment in tool design technology is equally disappointing, in view of the emphasis on heavy industry in Michigan's economy.

PART II. KINDS OF TECHNICAL CURRICULUMS PRESENTLY OFFERED AND NEW CURRICULUMS BEING PLANNED—1964-1970

An actual compendium of technician curriculums offered at all of Michigan's community colleges has not been prepared in the recent past, and so one is included here (see page 60) with the thought that it might be of use to high school guidance counselors.

New Curriculums Being Planned

Planning for the future was in evidence on every community college campus. Close contact is maintained with industry by almost all of Michigan's community colleges. All the college officials interviewed were reasonably well aware of recent technological advances and the demands which these make on educational institutions. Most colleges reported the active use of lay advisory committees, and the assignment of staff coordinators whose job it is to keep in touch with industry and assure "feedback" into curriculum planning.

Many colleges reported immediate or near-future plans to initiate curriculums like those listed in Table 4-3. If these reported plans are carried out, many of the empty spaces of that matrix will be X'd in by 1970. In addition, several colleges mentioned planning for new kinds of programs, not now offered by any Michigan community college. These are listed in Table 4-4 with the probable "level" at which they will be offered.

TABLE 4-3

TECHNICAL PROGRAMS CURRENTLY OFFERED IN MICHIGAN COMMUNITY COLLEGES AS REPORTED BY THE COLLEGES IN THE SPRING OF 1964

	Basic Technical Curriculums (Some engineering technology level—some highly skilled technology level)															
Community Colleges	Architectural	Automotive	Chemical	Civil	Data Processing	Drafting - Design	Auto Body Design	Electrical	Electronic	Hydraulics	Industrial	Industrial Management	Instrumentation	Mechanical	Metallurgical	Technical Illustration
1. Alpena			X			X		X			X				X	
2. Bay de Noc*																
3. Delta	X		X			X		X						X		
4. Flint		X						X						X		
5. Henry Ford		X				X		X	X						X	
6. Gogebic*																
7. Grand Rapids			X			X		X	X					X		
8. Highland Park*																
9. Jackson						X		X	X		X					
10. Kellogg					X	X			X			X	X	X		
11. Lake Michigan						X		X	X		X			X		
12. Lansing			X	X	X	X								X		
13. Macomb						X	X	X	X	X			X	X		X
14. Muskegon		X				X		X	X		X			X		
15. North Central Michigan**																
16. Northwestern Michigan***																
17. Port Huron						X			X		X					
18. Schoolcraft****	X		X			X		X	X	X	X		X	X		

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*Some occupationally related programs are offered but none is at the 2-year associate degree level, in the technologies covered by this study.

**Planning to initiate drafting and design technology soon.

***Planning chemical and data processing technologies.

****New campus. All those checked should be in operation by 1966-67.

TABLE 4-4

NEW TECHNICAL PROGRAMS BEING PLANNED, 1964-1970 AS REPORTED BY COMMUNITY COLLEGE OFFICIALS

Curriculum	Level
Computer technology	Semi-professional
Concrete technology	Highly-skilled
Heating, refrigeration, air conditioning technology	Highly-skilled
Industrial electronics technology	Semi-professional
Operating engineering technology	Highly-skilled
Physics research technology	Semi-professional
Tool and die technology	Highly-skilled

In planning new curriculums, the college officials interviewed indicated that the usual procedure is to check on "horseback judgments" by carefully conducted job surveys with industrial firms in the community. If the number and level of job openings seem sufficient to justify the new program (usually a demand of fifteen or more new employees per year in the technology being planned) an advisory committee is established to assist in planning curriculum and course content; to help specify the proper kinds and amounts of instructional equipment; and to help acquaint local industry with the new program—to build a status image for the program by the time the first class is ready to graduate.

Degrees Awarded

Upon successful completion of two years of study following a prescribed curriculum consisting of from 65 to 75 semester hours of credit, graduates from technical programs are awarded associate degrees. These include such degrees as: associate in applied science, associate in engineering technology, and associate in technology.

PART III. RECRUITMENT, TESTING, AND SELECTION PRACTICES

Recruitment

One of the major problems confronting Michigan's community colleges is the recruiting of sufficient numbers of interested and adequately prepared high school graduates to enter and be successful in collegiate-technical programs. A question was asked the college officials concerning the recruitment procedures used which were proving to be the most productive. Table 4-5 indicates the replies from officials of 12 community colleges.

TABLE 4-5

A RANKING OF RECRUITMENT PROCEDURES USED, AS REPORTED BY COMMUNITY COLLEGE OFFICIALS

Number of Colleges Reporting Success	Recruitment Techniques Used With Most Success
12	Liaison with high schools
10	Brochures and publications
8	Information to high school counselors
7	Liaison with industry
6	College career day for high school students
6	Talks to community groups
4	Frequent news releases
3	Mail promotion campaigns

Liaison with high school personnel, and supplying brochures and publications to high schools rank highest as means of attracting students to technical programs. There is substantial agreement here with the replies received from the high school guidance directors. But it should also be recalled that a lack of literature on technical programs and the failure of community college personnel to visit the local high schools were major complaints of many of the high school guidance directors. (See page 34 and comments in Appendix D.)

To summarize, the evidence indicates that well-informed high school counselors and teachers, enjoying close rapport with community college personnel, and supplied with ample quantities of attractive, informational brochures to give to students and parents, constitute the best recruiting agents for technician programs.

Testing and Selection Practices

While all the community colleges follow the "open door" policy—that is any graduate of an accredited high school is eligible for admission—the college officials stressed the fact that curriculums are not "open door." Students are given aptitude tests to assist in selection, curriculum and course placement. Students whose high school grade average is below "C", or who fall below established standards on the college's aptitude tests, are placed on a probation-at-entrance plan and may be required to take "repair" courses. The General Aptitude Test Battery (GATB) and the EPSAT, SAT, SCAT, ITED, and CQT, were indicated as some of the standardized tests used in selection and counseling procedures. Other colleges reported using locally developed aptitude and placement tests.

Measures for Predicting Success in Technician Programs

College officials were asked for their experience with regard to predictive measures for success in technical programs. High school grade average, rank in high school graduating class, mathematics grades, and English grades were indicated as being most predictive. Rank in the high school graduating class was mentioned as the most reliable of predictive devices by many of the officials interviewed. They look for standings at the 50th percentile or above for engineering technologies and at the 30th percentile and above for the industrial technologies. High school grade standings are combined with standardized test scores to determine placement in specific courses.

In general, the selection and testing practices in Michigan community colleges leave something to be desired. For one thing, there appeared to be a lack of distinction between the two levels of technology. Furthermore, in some institutions trade-level programs are masquerading under technology course names. Some colleges label their programs "trade-technical' as if there were really no essential differences in level and content between trade and industrial education and technician education. Little use is made of cut-off scores on standardized tests, or of the results of research findings, even though there have been several major studies made within the last three or four years which suggest widely used standardized tests, cut-off scores, and major guidlines for predicting the success of entering students in technical curriculums.*

Optimum High School Preparation for Collegiate-Technical Programs

One of the major objectives of the study was to determine the desirability of a "pre-technical" curriculum in high schools to provide preparation for college level technician programs. It is assumed that academically superior high school students will (properly) elect the college-preparatory and accelerated tracks in high school with an eventual baccalaureate degree and a professional career as common goals. Technician students in community colleges generally come from the middle level academic ability group—students who can succeed with mathematics and science when the emphasis is on applications; and with English, history, and other liberal arts courses if these courses are adapted to average high school students, and not "up-graded" for the accelerated group.

The college officials were asked this question:

"What kind of high school preparation would you consider optimum for entry into and success in your technical education programs?"

A check list was provided for their convenience, and the replies from the twelve colleges with technical programs are displayed in Table 4-6.

All respondents stated that a C (or better) average in high school is necessary to predict success in college technical programs, even at the highly-skilled technology level.

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*See for example the following:

Los Angeles City School District, Some Characteristics of Engineering Technical Students in the Los Angeles City Junior College District. Research Report No. 248, Los Angeles, the District, 1962.

The American Society for Engineering Education, Characteristics of Excellence in Engineering Technology Education, James L. McGraw, Project Director, Urbana, Ill.: The Society, 1962.

Greenwood, R. Leroy, "Predicting Success in Technical Education Programs" Technical Education News, 23:22-23, December 1963.

TABLE 4-6

HIGH SCHOOL COURSE REQUIREMENTS FOR AN OPTIMUM PRE-TECHNICAL PROGRAM, AS JUDGED BY TWELVE COMMUNITY COLLEGE OFFICIALS

Item	Number of College Officials Favoring Each Item (Total of 12 Respondents)	
	For Aspirants to Semi-Professional (Engineering) Technologies	For Aspirants to Highly-Skilled (Industrial) Technologies
High school graduation required	7	4
College-prep curriculum favored	6	2
Vocational (shop) curriculum favored	2	5
General curriculum favored	2	3
Algebra, elementary	8	5
Algebra, intermediate	6	3
Geometry, plane	8	3
Geometry, solid	2	0
Trigonometry	6	2
Physics, standard course, with laboratory	8	4
Chemistry, with laboratory	5	1
English, three years	10	4
Drafting	5	5
General shop	3	5
SMSG ("new") mathematics	2	1
PSSC ("new") physics	2	1

Although there is certainly not unanimous agreement among community college officials with regard to optimum high school preparation, some inferences can be drawn from the compilation of Table 4-6.

1. None of the currently offered "tracks" (i.e. college prep, vocational, or general) is considered optimum by community college officials. Of tracks now offered in Michigan high schools, the college prep track is preferred for aspirants to the engineering technology programs, and the vocational (shop) track for aspirants to the industrial technologies.

2. Three years of English is given strong support for the engineering technologies and significant support for the industrial technologies.

3. The "new math" and the "new physics" are not favored by very many of the respondents, for either level of the technology programs.

4. Although significant differences exist between "optimum" ratings as regards the two levels of collegiate-technical programs, a compromise pre-technical high school program might be inferred from the above tabulations which would include:

English - 3 years

Algebra - 1 or 2 years

Plane Geometry -

Trigonometry -

Physics (with lab) -

Drafting - 1 or 2 years

General Shop - 1 or 2 years

plus general education courses and electives (non-accelerated level) to complete graduation requirements.

Some additional open-ended comments of the respondents should be noted. The importance of laboratory work in physics was emphasized, because of the need for future technical students to become familiar with the use of sensitive instruments and precision equipment. Problem solving should also be a major activity in the physics course. Slide rule should be taught as a part of the high school mathematics and physics courses.

The drafting courses should be re-structured so that they reflect the new emphasis on graphics—the association of mathematics with drawing, the use of exploded views, freehand sketching, nomography, and various art techniques.

The general shop course needs a complete overhaul also, if it is to be useful for technicians. More emphasis should be placed on precision measurement, on use of instruments and test equipment, and on materials and processes. The typical "vocational machine shop," "vocational cabinet shop," or "vocational electric shop" courses are not very well suited to the pre-technician student. He needs a more nearly engineering approach to materials and processes, rather than an approach which attempts to train future skilled tradesmen. Furthermore, the pre-technical student will not be able to fit 15-hour blocks of "shop time" into his weekly schedule of classes, and he will not need the "related-math" and "related-science" which usually accompany the vocational shop courses, for he will be getting these subjects on a more realistic level of rigor in his regular academic program.

Should High Schools Initiate Pre-Technical Programs?

To the specific question, "Would you like to see high schools initiate specialized pre-technical programs at the 11th and 12th grade levels?", officials at nine out of the twelve community colleges gave a strong affirmative answer. Two of the others expressed a preference for graduates of the college preparatory programs as now offered by the high schools in their districts, and one respondent preferred "top quality" graduates (B's or better) from the local high schools' vocational programs.

Guidance Services for Community College Technical Students

A number of queries about guidance services were put to the community college officials. Their responses are summarized (and in some cases, averaged) in the following statements:

1. All the colleges try to emphasize guidance, and individual and group counseling.

2. The ratio of students to full time equivalent counselors ranges from 500:1 to 200:1 for the college-wide program. No such ratio could be stated for the technical program taken by itself.

3. Students in the technician programs make much use of the central counseling office, and, in some colleges instructors in the specific technical fields are assigned part-time counseling duties for the students in their subject matter areas.

4. Average counseling time per student per semester ranged from a low of 0.5 hour to a high of 3 hours.

5. Most respondents agreed that the weak spot in the guidance structure is at the initial interview or first point of contact. This first contact is frequently with a clerk or registrar's assistant, and hasty decisions about tests, course enrollment, or even career selection may be made before a professional counselor is involved in the process. "Undecided" students make wrong decisions; tests which should be scheduled are not scheduled; and students frequently enroll in courses (and thereby make preliminary curriculum decisions) for which they are inadequately prepared, or for which they have small interest. By the time trouble erupts and a counselor is sought out, the damage is already done and it is frequently irreparable.

6. Guidance is the keystone to success in community college occupational programs. More emphasis must be placed on vocational (career) guidance.

7. Much closer articulation between college guidance programs and high school programs must be brought about.

PART IV. PLACEMENT AND FOLLOW-UP SERVICES FOR TECHNICIAN GRADUATES

Placement Office Procedures

A vital service, which also boosts the quality and recognition of technical programs, is the placement function. The technician graduate should be given all the help possible in finding suitable employment. Placement personnel aware of the needs and "climate" of industry and business, and well versed in the curriculums offered by their institutions, can establish the rapport with employers so necessary to the operation of effective technical programs. A series of questions was asked concerning community college placement services.

The responses summarized below came from the twelve colleges operating technical programs, and from observations by the researchers during the visit to the colleges.

1. Seven of the twelve colleges have a career placement service.

2. A total of nine colleges reported that placement services for part-time and summer jobs (casual placement) were available at the college.

3. There is an attempt to "match" technician students to known job openings at eight of the colleges. The placement office makes an effort to get listings on current openings and anticipated future openings.

4. Placement of most graduates is within the state of Michigan. The exception to this is the field of electronics.

5. The placement official was in all cases assigned that responsibility on a part-time basis. In almost all cases his other responsibilities were regarded as the more important part of his job at the college.

6. The placement function is usually not dignified by an office of its own. Physical facilities for placement activities are uniformly inadequate.

As a general judgment it should be said that the placement function in Michigan's community colleges is at present quite weak. A tremendous amount of improvement is needed, and needed immediately. Full-time placement directors, with capable secretarial assistance, and attractive and spacious offices should be provided. The director should know that his major responsibility is placement, and that his total performance will be judged on the basis of the success of the placement office. He should publicize and "promote" his office and its services to students and potential employers alike. The first thought in any employer's mind when a job needs to be filled should be, "I'll call the placement office at the community college."

Education and training youth for jobs is only a part of the community college function. Placing them in jobs for which they are suited, and assisting them to grow in those jobs to positions of increasing responsibility—this is the other part of the college's function. Placement is much too important to be trusted to another agency, or to a part-time faculty assignment, or to the haphazard job-hunting efforts of students themselves.

The Follow-Up of Former Students

Continuous feedback of information from industry and business is essential to on-going curriculum planning. One of the best sources of feedback information is the group of employees who were former students at the college. And the best way to keep in touch with them and obtain their suggestions for improving curriculum is through organized follow-up procedures, perferably closely associated with the guidance and placement functions.

A section of the interview instrument was devoted to gathering information about follow-up practices in operation at the twelve colleges with technician curriculums. A summary of the findings follows:

1. Five colleges had established and were continuing follow-up procedures. Three had recently completed rather lengthy and detailed follow-up studies.

2. Only three colleges reported that feedback from graduates was an integral part of curriculum revision.

3. All colleges reported that last year's technician graduates (class of 1963) had all been readily placed, either through their own efforts or through the placement office. There was a general consensus that there are many more jobs available than the numbers of technicians being graduated. In some specialties however, the better job opportunities were out-of-state (e.g. in electronics technology).

4. Entry pay rates were reported (on the basis of follow-up studies) as ranging from $415 to $525 per month for engineering technicians, and from $325 to $450 per month for industrial technicians. Rates of pay for experienced techicians (five years on the job) were reported as ranging from $400 to $600 per month for industrial technicians and from $450 to $750 for engineering technicians.

SUMMARY OF THE COMMUNITY COLLEGE PHASE OF THE STUDY

1. Twelve out of eighteen of Michigan's community colleges operated one or more technical education curriculums, as of June, 1964.

2. Enrollments in technical curriculums increased from 916 in 1961 to 1637 in 1963-64, an increase of 78 percent in two years. Although this is a healthy percentage growth, the fact is that enrollments in technical education programs are presently quite disappointing. Less than one student in 20 in Michigan's community colleges was enrolled in a technical education program during the college year 1963-64.

3. Attrition is a major problem in technical programs. Typically, only about 50 percent of students survive the freshman year and enter second year work, and less than 20 percent of an original freshman group will actually graduate with the associate degree. However, many students accept employment in the field of the major, without completing degree requirements, so the attrition should not be looked upon as a total loss.

4. There is evidence that community colleges put considerable emphasis on guidance; and that testing, selection, and counseling procedures are rapidly being improved. There is room for further improvement however, both at the college, and in establishing better articulation with high school counseling staffs.

5. Most respondents admitted that qualified students do not flock into technician programs. Many unqualified students are eager to enroll, but students whose abilities are commensurate with the demands of technical courses, try (frequently unsuccessfully) the pre-engineering transfer program. Trouble spots were identified as:

a. The "drive" for the baccalaureate degree on the part of students and parents.

b. The lack of career counseling in the high school, with middle level occupations being given little consideration as counselors talk with students.

c. The uncertain status of the technician in Michigan's industry.

d. Lack of adequate subject matter preparation in high school.

6. Respondents strongly supported the concept of pre-technical curriculums in Michigan high schools. An optimum "fourth track" might well include:

English - 3 units

Algebra - 1 or 2 units

Plane Geometry -

Trigonometry -

Physics (with lab) - 1 or 2 units

Drafting - 1 or 2 units

Shop - 1 or 2 units

Social Sciences and electives to meet graduation requirements

The mathematics, science, and "liberal arts" courses would need to be especially planned for students of middle level academic abilities. Forcing these students into "accelerated" liberal arts sequences, and the "new math" and "new physics" courses should be avoided.

The high school drafting and shop courses for a pre-technical curriculum should be especially planned for that purpose. Shop courses for high school trade and industrial students are not well suited to the needs of pre-technician students.

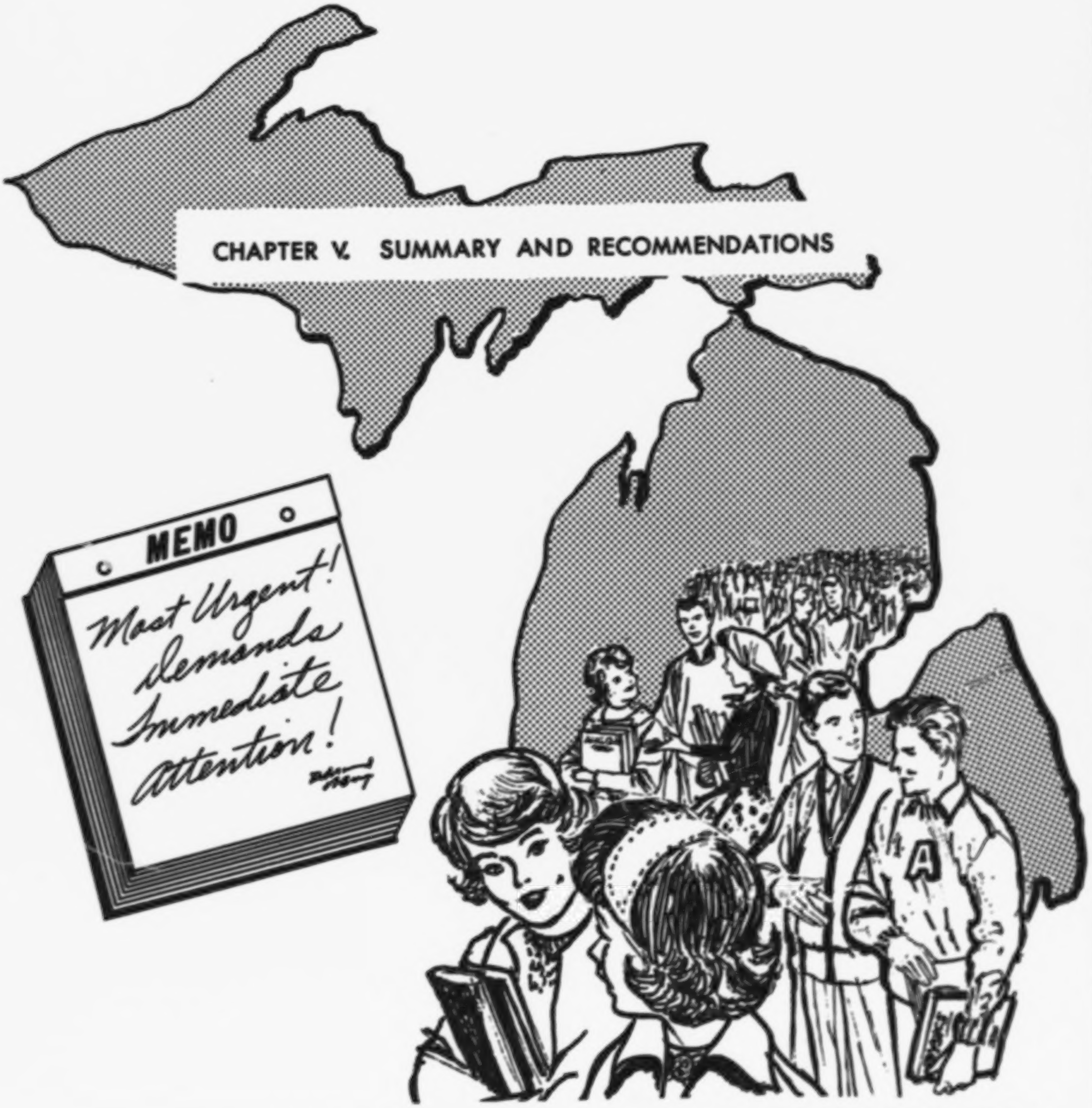
7. There is strong evidence from the community college survey that articulation with high schools in the area is not as good as it should be. Since the high school phase of the study identified this as a major problem also, it would appear that immediate action, at both levels, should be taken to set up effective articulation procedures at three levels—administrators, counselors, and classroom instructors.

8. Some community colleges are publishing and disseminating attractive brochures about their technical programs. Others are not, and this lack should

be remedied. The only way to combat lack of information and misinformation is to supply correct information. And the flow of information must be continuous, not just a "one-shot" effort.

9. Michigan's community colleges are planning for the growth of technical education. Some colleges with no programs at present have plans to initiate programs, and certain new programs are in the planning stages at other colleges, to be added to existing curriculums. College officials are convinced of the need for technician graduates in Michigan and they are actively engaged in efforts to overcome the several obstacles to progress discussed above.

CHAPTER V. SUMMARY AND RECOMMENDATIONS


MEMO
Most Urgent! demands Immediate attention!
A

Parents need:	More information to assist youth
Community colleges need:	Better informed and prepared technical students
High schools need:	A pre-technical curriculum
High school students need:	Increased vocational guidance
Education at all levels needs:	Better information and cooperation from Michigan industry

The present study elicited data and opinion from officials of eighteen public community colleges and from guidance directors of 148 of the larger high schools, all in Michigan. The general problem under study was the status of technical education in Michigan. Specifically, information was sought on two major phases of the problem:

1. Guidance and counseling procedures in effect in high schools and community colleges, devoted to the needs of students who either are, or perhaps should be, interested in technical education for employment in industry.

2. The feasibility of a pre-technical "track" in Michigan high schools, and the identification of a satisfactory pattern of high school courses for such a curriculum.

SUMMARY OF THE FINDINGS

1. Current status of technical education in Michigan community colleges. Out of a total community college enrollment of approximately 39,000 students in 1963, only 1637 enrollments in technical education (engineering technology and industrial technology) were reported. Even among occupation-centered curriculums (13,700 students reported in 1963), technical programs are attracting only about one student in eight.

2. High school guidance counselors reported that only about 10 percent of their graduates for 1963 were known to have enrolled for full-time study in any kind of an occupation-centered program in a Michigan community college. Almost three-fourths of the guidance counselors reported that technician careers and technical education were discussed with high school students only if the students themselves asked about such careers and educational programs.

Major reasons for low enrollments in technical education, as reported by high school guidance counselors, are listed here, with the percentages of respondents indicating each reason.

--inadequate vocational guidance	30%
--lack of interest in occupational education on the part of students	62%
--lack of information on technical careers and technical education available to students and their parents	60%

3. How well are high school guidance personnel acquainted with technical programs at the local community college?

--85% selected a grouping of high school courses which community college personnel would select as "good preparation" for a technical education program.

--76% know the approximate academic ability level necessary for success in engineering technology and industrial technology programs.

--79% are of the opinion that technical occupations will show a marked growth in the next five years.

4. What degree of rapport seems to be in evidence between guidance directors and community college personnel?

--Only 41% of the high school guidance directors were well acquainted with the college guidance director.

--46% were well acquainted with the college placement director.

--Only 20% were acquainted with the director of the technical programs at the nearest community college.

--Very few high school guidance directors knew any of the instructors in the college technical programs.

5. What kind of high school courses do guidance directors perceive as constituting adequate preparation for entry into technology programs?

--Over 80% felt the following high school courses were important for a "pre-technical" curriculum:

English - 3 units
Algebra - 1 or 2 units
Geometry - 1 unit
Drafting - 1 unit

Trigonometry - 1/2 unit
Physics - 1 unit
Basic shop - 1 unit
Social studies - 2 units

6. What were some of the suggestions most frequently offered by high school guidance directors for the improvement of technical education in Michigan?

a. To the community colleges--

--An energetic recruiting program for technical students

--Improve the articulation, give consulting help.

--Feedback and follow-up studies.

--More emphasis on occupational education programs--
create a new "image."

--Better public relations and promotion to build status
for technical programs.

--More information to high school students and their parents.

b. To improve high school guidance services--

--Need trained vocational counselors.

--Internship for counselors.

--Acquaint all teachers with the needs for occupational education programs.

--Improve the counselor-student ratio.

--Close correlation between high school and college subject area teachers.

7. What the community college officials indicated: In assessing the findings of the interview instrument, the evidence brings out these major points:

a. Lack of students for technical programs is believed to be due, in large measure, to poor rapport between high schools and community colleges.

b. Some college officials felt that ECPD accreditation would add stature to the technical programs and increase the enrollment.

c. Because of inadequate preparation, many students need to take remedial mathematics and English before being accepted into the technical programs.

d. Several of the colleges reported good placement and follow-up procedures, but this is a weak area in most colleges.

e. All colleges indicated that there is a shortage of technician graduates, due to the shortage of qualified enrollees.

f. It appears that the community colleges are just beginning to make a consistent effort in the very important area of training qualified technicians.

MAJOR CONCLUSIONS

From the findings, a series of generalized conclusions can be drawn:

1. An educational "disaster gap" does exist for a large group of "middle level" high school graduates.

2. This gap exists partly as a result of inadequate vocational guidance in high schools.

3. This gap exists partly because of lack of status for the "middle-manpower" jobs.

4. This gap exists partly because community colleges are not active enough in furnishing information to high schools, to students, and to the public, about technical education.

5. This gap exists because of certain socio-cultural influences which are strong factors in motivating students to shy away from community college programs which do not lead to the baccalaureate degree.

6. This gap exists partly because of a need for a new kind of high school curriculum designed to prepare students for entry into college-level technical programs in the same manner that the "college prep" curriculum prepares for entry into a baccalaureate degree program.

7. This gap is getting wider because of the rapidly increasing numbers of high school graduates in Michigan and the slow growth of technical education programs in Michigan's community colleges.

RECOMMENDATIONS FOR ACTION

1. Initiate pre-technical, community college-preparatory curriculums in high schools throughout the state, with the needed content in mathematics, the physical sciences, English, drafting, and basic shop experiences, to prepare students for entry into community college technical programs.

2. Increase the emphasis on vocational guidance in high schools and "open up" the technical occupations as career choices for promising high school youth.

3. Improve the articulation between the high schools and community colleges as quickly as possible and across a broad front. This rapport needs to be cultivated by action taken at both the high school and the community college.

4. A need exists for agreement on the goals of technical education accepted by all groups--the high school, the community colleges, industry and business, and the public in general. There should be well-defined areas of responsibility, with the curriculums developed around a core of applied science and mathematics with supporting technical courses. Specialized skills need to be emphasized, but changing job demands require that the curriculum be balanced by a general education sequence of courses.

5. A need exists at the community college level to maintain rather clear distinctions between highly-skilled technology curriculums, engineering technology curriculums, and pre-engineering (transfer) curriculums. Trade- and craft-level curriculums should be offered by community colleges, but they should not be confused with technical-level curriculums. The term "trade-technical" should not be used.

Technical-level curriculums should lead to the associate degree, and the "status" of this degree should be "promoted" with students, with Michigan's industries, and with the general public.

6. Michigan's community colleges should organize a technical education association, and embark on an aggressive informational program which would flood the state with information about technician occupations and technical education programs. The support and influential backing of Michigan industry should be sought to aid in this effort.

7. Placement and follow-up programs at Michigan 's community colleges should be vastly improved, beginning now!

8. College technical education deans and curriculum experts should offer their services in assisting high schools to initiate meaningful "pre-technical" curriculums.

9. College guidance directors should offer to assist high school guidance departments in planning better programs of career counseling with attention to the technical occupations.

RECOMMENDATIONS FOR FUTHER STUDIES

Problem areas uncovered during the progress of the present study indicate a need for other studies, as follows:

1. A state-wide study of the utilization of technicians in industry, together with projections for future needs, and an inquiry into curriculum content as dictated by actual job demands.

2. A study of technician job opportunities for women.

3. A study of optimum predictive devices (tests, high school grades, etc.) for indicating probable success in technical education programs.

4. A study of the relationship of apprenticeship to technical education and to technician jobs in industry.

5. Follow-up studies of technician graduates, conducted annually by all community colleges, so that continuous information may be "fed back" into the technical program.

APPENDIX A

BIBLIOGRAPHY AND PRELIMINARY MATERIALS

Bibliography

Glossary of Some Terms Used in Technical Education

Correspondence Used in the Study

Summary of the Project

Disaster Gap Leaflet

Memorandum to High School Principals and Guidance Directors

List of Participating Community Colleges

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A SELECTED, ANNOTATED LISTING OF TECHNICAL EDUCATION LITERATURE

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A comprehensive source book to introduce the community college concept. The occupational education function is discussed at length. Although this book is fifteen years old, much of the material is currently adaptable.

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Facing Facts About the Two-Year College. Education Department, Box 36, The Prudential Insurance Company of America, Newark 1, N. J., 1964. (free)

One of a series brought out by Prudential about post-high school education, as a public service to youth, parents, and others. Tells the "junior college story" in an easy-to-read form. Especially useful for high school personnel in counseling youth.

Harris, Norman C. *Technical Education In the Junior College - New Programs for New Jobs*. Washington, D.C.: American Association of Junior Colleges, 1964.

A current source booklet planned and developed by the Curriculum Commission of the American Association of Junior Colleges to provide new insight into technical education. It provides guidelines and advice on the establishment of technical education programs in community colleges. It endeavors to create better public understanding of rapidly changing manpower needs and points out the new directions which post-high school education must take to meet them. It should be of interest to high school students and their parents, as well as to high school and college counselors.

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The history, development, and current status of the technical institute in America. Clearly explains the kinds of programs offered by technical institutes.

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A detailed account of the guidance function in the junior college.

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A thorough appraisal of the junior college movement in America; the result of research studies conducted over a decade. Used as a basic reference source for an understanding of junior college philosophy.

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A leading source of information on long-range projections of need for scientific and technical personnel.

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This report presents a study of a program designed to meet the needs of the average high school student through the establishment of a pre-technical curriculum in two high schools and Cogswell Polytechnical College. The hypothesis is that average high school students can be successful in two-year college level technical curriculums if they have had the proper kind of high school preparation. Available from Cogswell Polytechnical College, San Francisco.

Technical Education News. Published periodically by the McGraw-Hill Book Co., Inc., 330 W. 42nd Street, New York, New York. (free)

Best single source of current information on engineering and industry-related technical education. Should be on every counselor's reading list.

Technical Education Yearbook, 1963-64. Ann Arbor, Michigan: Prakken Publications, Inc., 416 Longshore Drive.

A directory containing lists of schools offering technician training, the federal laws and regulations concerning technical education, case studies of programs now in operation, statistical information about the field, and incorporating a forecast of the future of technician training. Recommended for all persons interested in technical education.

U. S. Department of Labor. *Careers for Women as Technicians*. Women's Bureau, Bulletin 282. Washington, D.C.: Government Printing Office, 1961.

Presents the thesis that women are needed in the semi-professional occupations. It lists the job fields which hold the greatest promise for women.

GLOSSARY OF TECHNICAL EDUCATION TERMS AS USED IN THIS STUDY

attendance area - normally considered to be within a 30-mile radius of the community college.

career placement[1] - placing graduates of an occupational curriculum on jobs for which they were educated and trained in the community college.

casual placement[1] - placing any and all students on part-time and summer jobs, usually unrelated to their course of study, for the sole purpose of "making some extra money."

level[2] - of a program is determined by its objectives, and these are based on the type of position for which the students are being educated and trained.

non-technical (general education) courses - courses which add to the cultural development of the student, recommended to comprise about 18-20 semester hours of the technical curriculum. The general education requirement usually consists of 6 credit hours of English, 6 credit hours of humanistic-social studies, and about 6 credit hours of other non-technical studies such as human relations, psychology, speech, etc.

quality[2] - is a measure of how well a program achieves its objectives.

quarter credit hour - equivalent to one hour of classroom lecture or recitation per week plus approximately two hours of assigned homework (or three laboratory hours) for an academic quarter of from 11 to 13 weeks. Usually considered to be two-thirds of a semester credit.

semseter credit hour - equivalent to one hour of classroom lecture or recitation per week plus approximately two hours of assigned homework (or three laboratory hours), for a period of 15 to 18 weeks.

supporting technical courses[3] - the courses in the curriculum which are used by the graduate to function in his technical speciality--such as engineering laboratory, technical writing, graphics, and strength of materials.

technical curriculum[4] - an integrated sequence of organized courses and educa-

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1. Harris, Norman C., *Technical Education in the Junior College—New Programs for New Jobs*. Washington, D.C.: American Association of Junior Colleges, the Association, 1964, p. 89.
2. Adapted from: American Society for Engineering Education. *Characteristics of Excellence In Engineering Technology Education*. Urbana, Illinois, the Soceity, 1962.
3. Harris, op. cit., p. 39.
4. Ibid.

tional experiences which leads to occupational competence in the specialized technical field and also leads to graduation with the Associate Degree. All technician curriculums should include a core of general education courses.

technical curriculum length - Usually two academic years. An academic year is nine months, two semesters, or three quarters (30-36 weeks).

technical specialty courses[5] - Those courses in the curriculum which contribute to the student's ability to function properly in his technical specialty, comprising from 30 to 50 percent of the curriculum. These courses utilize adequate laboratory instruction in support of the lecture and recitation portions of the curriculum to which they are related.

engineering technology - See page 12 for this definition.

highly-skilled technology - See page 12 for this definition.

technical mathematics - A sequence of courses especially designed for technical students rather than the classical compartmented sequence of algebra, geometry, trigonometry, analytic geometry, and calculus. The emphasis is on technical applications with the topics correlated so that mathematical skills needed in technical physics and in the student's technical specialty are covered at the proper time.

(a) The first year of technical mathematics may be the same for both the industrial and engineering technologies, with a prerequisite of at least a knowledge of elementary algebra. A basic first semester coverage includes: computation skills, algebraic operations, elementary topics in geometry and trigonometry, logarithms, slide rule, vectors, and graphical representation. The second semester topics include more depth in algebra, trigonometry, vector algebra, slide rule, J-operator, and advanced graphics.

(b) Students aspiring to become engineering technicians, with a grade "B" or better in the first year of technical mathematics and having satisfactorily completed technical or engineering physics, continue the third semester with the following topics: analytic geometry, differential and integral calculus. Students in the electrical and electronics technology undertake specialty topics such as number systems, applications of number systems, and Boolean algebra for the fourth semester.

technical physics - A two-semester, non-calculus based course in applied physics at a college level for both the industrial and engineering technology levels featuring problem-solving and meaningful laboratory work. The laboratory experiments are exercises in technical investigation requiring a technical report by the student complete with his own analysis and interpretation of the results. Includes the following topics: precision measurement, properties of matter, mechanics, heat, thermodynamics, sound, acoustics, light, optics, magnetism, electricity, electronics, and an introduction to atomic energy.

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[5] American Society for Engineering Education, op. cit., p. 33.

Preliminary letter to community colleges

THE UNIVERSITY OF MICHIGAN
School of Education
Ann Arbor, Michigan 48104

Department of Vocational Education
and Practical Arts

Community College Technical Education Study

March 16, 1964

Dear____________

We are conducting a study of the feasibility of pre-technical programs in Michigan high schools (see digest enclosed) to determine if there is a need for a new kind of college preparatory program; one that specifically prepares students for entry into community colleges in semi-professional, technical, and industrial curriculums.

Part of the procedure for gathering data for this study will be the utilization of a mailing type questionnaire which will be sent to selected high schools which are located in the attendance areas of Michigan community colleges. Consequently, we need the names of the high schools from which you draw the greater percentage (say 80%) of your students. Would you send us a listing of these for your attendance area?

As another phase of the study, we would like to visit your college during March, April, or May for the purpose of gathering information which could assist in describing an optimum high school pre-technical program of studies. A detailed letter of explanation will follow in the near future, which will request a suitable date for visiting your college. For the present however, the list of high schools referred to above will get us off to a good start. Would you please give us this information at your earliest convenience?

Thank you for your co-operation in this matter.

Sincerely yours,

Norman C. Harris
Associate Professor
Technical Education

NCH:pb
Enclosure

Follow-up letter to community colleges

THE UNIVERSITY OF MICHIGAN
SCHOOL OF EDUCATION
ANN ARBOR, MICHIGAN 48104

DEPARTMENT OF VOCATIONAL EDUCATION
AND PRACTICAL ARTS

Community College
Technical Education Study

March 23, 1964

Dear ____________

In reference to a recent letter to you concerning the project, A Study of the Feasibility of Pre-Technical Programs in Michigan High Schools, we are writing to explain the entire project to you.

Exact information on selection and retention rates in Michigan community college technical education programs is not available, but studies of this problem in California and Florida indicate that fully half of the freshman students desiring or electing technical curriculums are not properly prepared to undertake the first semester courses involved. The extent to which this may also be the case in Michigan needs to be investigated. A second, and most important phase of the study is to arrive at a "model" pre-technical curriculum which might be developed in some or all of the high schools in your attendance area. The personnel are acquainting their students with the technical occupations as possible career choices and with the local community college as an institution where the required education and training may be obtained.

A questionnaire will be used by an interviewer who will visit your campus, to obtain data on the admission and retention policies of your college. In addition, the interviewer will elicit some opinions from your technical education and guidance staffs as to what would constitute "optimum" high school preparation for your technical education programs. All data will be kept confidential and used for statistical purposes only. The findings, conclusions, and recommendations of the research study will be published as an official document of The University of Michigan, and will be available early next fall.

As pointed out in the report of the "Blue Ribbon" Citizens Committee on Higher Education, "the community colleges through their technical-vocational and their other skill training activities are tied into the basic economic productivity of our state". In addition, the Michigan Council of Community College Administrators has recently prepared a document which sets forth the important role of these colleges in occupational education. In the years ahead technical education opportunity for thousands of Michigan youth must be provided by the community colleges.

However, young people will enroll in large members in college-level technical programs only if they are adequately informed about the technical occupations as career choices; and they will succeed in these programs in community colleges only if their high school preparation is adequate in content, scope, and level.

Visits to each of Michigan's community colleges will be made within the next three months, either by the writer or by Mr. William R. Yencso, assistant in research for the project.

We hope to have your co-operation in this study, as the results should be of value to the State as a whole.

Sincerely yours,

Norman C. Harris
Associate Professor
Technical Education

NCH:emr

The University of Michigan

Community College Technical Education Study

SUMMARY OF THE PROJECT

A Study of the Feasibility of Pre-Technical Programs in Michigan High Schools

I. The Purpose and Scope

The purpose of this study is to determine optimum high school preparation for students aspiring to enter college-level industrially oriented technician programs and secondly, to determine the extent to which high school guidance services are acquainting students with semi-professional and technical occupations as career choices. This study is funded under a grant from the Michigan State Board of Control for Vocational Education and is concerned with semi-professional (engineering) technology and highly skilled (industrial) technology. Because of the general expansion of American industry and the increased complexity of modern technology, large numbers of technicians are needed in research, development, design, testing, production planning and manufacturing. Success in these occupations requires highly specialized preparation and therefore youth must select their occupational goals and be adequately prepared while in high school for subsequent entry into college-level technician programs. It is recognized that needs also exist in other kinds of technologies but this study is concerned with only the industrial technologies.

II. Procedure

Two kinds of questionnaires will be used. One will be mailed to high schools in the primary attendance areas of Michigan community colleges to ascertain the extent to which career counseling and curriculum information is made available to students about semi-professional and technical occupations, and the extent to which students are being prepared for entry into these curriculums at the community colleges.

The other questionnaire will be used by an interviewer who will visit all the Michigan community colleges to gather data which might suggest the optimum high school preparation necessary for success in community college technician programs. A further objective of the community college visits will be to gather information about their selection and retention policies in their technical education programs.

III. The Results

The study will be published and distributed throughout the State. The findings will give high school students, parents, counselors, and curriculum coordinators a better insight into the career opportunities in technical occupations, and the requirements of community college technician curriculums. Hopefully, the study will result in increased co-operation between high schools and community colleges with the possibility of a development of "pre-technical" curriculums in many of the Michigan high schools.

THE UNIVERSITY OF MICHIGAN

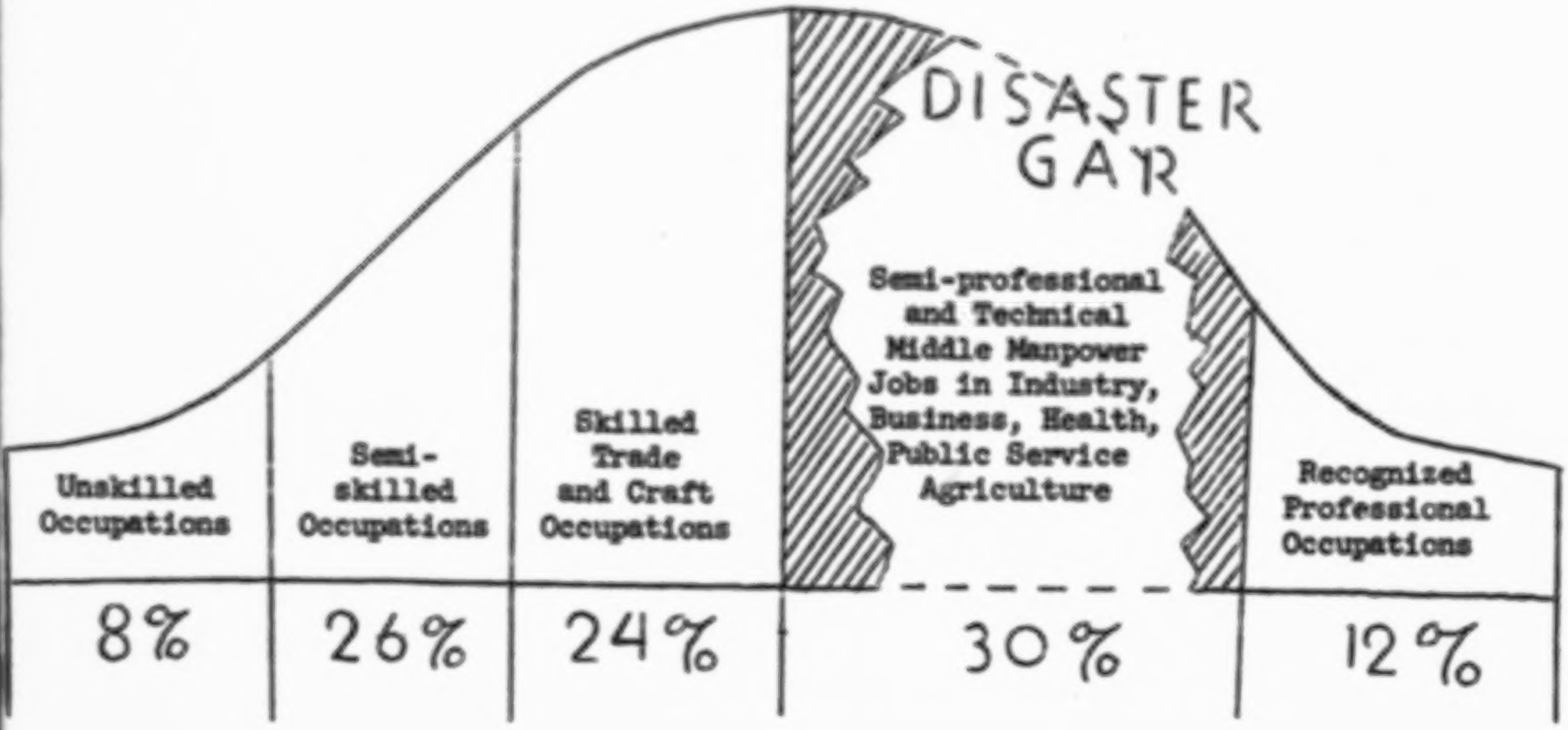
Community College Technical Education Study

Questionnaire For Michigan High Schools

- JOBS -

The National Science Foundation Estimates Technician Shortage of 68,000 Per Year for the Next Decade

Distribution of the Work Force - 1960-1970



REASONS FOR THE DISASTER GAP:

1. *High school youth and parents are not aware of the increasing opportunities in middle manpower fields.*

2. *Lack of proper preparation and motivation of high school graduates to enter and be successful in associate degree technician programs in community colleges.*

SOLUTION:

1. *Proceed "full steam" to increase awareness of the excellent opportunities in middle manpower occupations for thousands of high school students.*

2. *Consider the feasibility of PRE-TECHNICAL curriculums in the high schools.*

3. *Build a more effective liaison between high schools and community colleges.*

THE UNIVERSITY OF MICHIGAN
SCHOOL OF EDUCATION
ANN ARBOR, MICHIGAN 48104

DEPARTMENT OF VOCATIONAL EDUCATION
AND PRACTICAL ARTS

Community College
Technical Education Study

MEMORANDUM

DATE: April 30, 1964

TO: Michigan High School Principals and Guidance Directors

FROM: Norman C. Harris, Associate Professor, Technical Education

We need a few minutes of your time to assist us in a State-sponsored research project; the results of which will be beneficial both to your high school graduates and to the economic productivity of our State. The public community colleges in Michigan, of which there are eighteen at present with several more being organized, play an indispensable part in our system of collegiate education. Increasingly, their most important function will be to provide collegiate grade technical-vocational education for the vast group of high school graduates who will want to enter semi-professional and technical occupations.

However, young people will enroll in community college technical programs only if they are adequately informed about technical occupations as career opportunities; and they will succeed in these programs only if their high school preparation is adequate in content, scope, and level. The purpose of this study then is to determine the kinds of high school preparation most beneficial for those entering technical programs in community colleges, and secondly to determine what factors motivate students to select the semi-professional and highly skilled technician curriculums offered by Michigan's community colleges.

The enclosed questionnaire solicits information from your high school which will help us in the overall analysis of this problem. Neither your identity nor the name of your high school will be revealed in the body of the report.

You will receive a copy of the final study report, whose findings may be helpful in the further development of your guidance program. Our schedule calls for an analysis of the returns from the questionnaire during the month of June. Would you please therefore return the completed document on or before May 25.

Thank you for your co-operation.

NCH:pb

Enclosure

PUBLIC COMMUNITY COLLEGES OF MICHIGAN

(Participating in the Study as of April, 1964)

1. Alpena Community College, Alpena, Michigan, Stanley Van Lare, Director.
2. Bay De Noc Community College, Escanaba, Michigan, Richard L. Rinehart, President.
3. Delta College, University Center, Michigan, John Brinn, Dean.
4. Flint Community Junior College, 1401 E. Court St., Flint, Michigan, Lewis R. Fibel, Dean.
5. Gogebic Community College, Ironwood, Michigan, Jacob A. Solin, Director.
6. Grand Rapids Junior College, 143 Bostwick Ave., N.E., Grand Rapids, Michigan, Donald D. Fink, Dean.
7. Henry Ford Community College, 5101 Evergreen Road, Dearborn, Michigan, Fred K. Eshleman, Dean.
8. Highland Park Junior College, Highland Part, Michigan, G. O. Withey, Dean.
9. Jackson County Community College, Jackson, Michigan, William N. Atkinson, President.
10. Kellogg Community College, Battle Creek, Michigan, Leon C. Billingsly, Director.
11. Lake Michigan College, 750 Britain Ave., Benton Harbor, Michigan, Robert Lahti, President.
12. Lansing Community College, 419 N. Capitol Ave., Lansing, Michigan, Philip J. Gannon, Dean.
13. Muskegon County Community College, Muskegon, Michigan, Ralph A. Austermiller, President.
14. North Central Michigan College, Petoskey, Michigan, Alfred D. Shankland, Director.
15. Northwestern Michigan College, Traverse City, Michigan, Preston N. Tanis, Director.
16. Schoolcraft College, 9901 Newburg Road, Livonia, Michigan, Eric J. Bradner, President.

17. Port Huron Junior College, 323 Erie St., Port Huron, Michigan, James C. Browning, Dean.

18. Macomb County Community College, Warren, Michigan, Robert Turner, President.

APPENDIX B

INTERVIEW FORM USED FOR THE COMMUNITY COLLEGES

The University of Michigan

Community College Technical Education Study
Personal Interview Form

Community College

____

Person Interviewed ______________________________

Title ______________________________

Duties ______________________________

Objectives: To survey the programs of technical education and training available in Michigan community colleges and to elicit opinions of technical educators about the high school preparation necessary for success in the college level programs. The present study is concerned only with two levels of technical education, both of which produce technicians for industry:

a) Semi-professional (engineering) technology
b) Highly-skilled (industrial) technology

PART I. INFORMATION ON TECHNICIAN CURRICULUMS OFFERED

	Level		Number of Students			
	(a) Semi-professional (engineering) technologies	(b) Highly-skilled (industrial) technologies	Presently enrolled	Graduated or Completed in year listed		
A. TECHNOLOGIES				63	62	61
1. Automotive						
2. Civil						
3. Chemical						
4. Drafting & Design						
Architectural						
Electrical/Electronic Drafting						
Technical Illustration						
Die Design						
Tool Design						
Machine Design						
5. Electrical/Electronic						
Computer Communications						
Data Processing						
Electrical						
Electronic						

	Level		Number of Students			
	(a) Semi-professional (engineering) technologies	(b) Highly-skilled (industrial) technologies	Presently enrolled	Graduated or completed in year listed		
				63	62	61
6. Industrial						
Instrumentation						
Numerical Control						
Plant Layout						
7. Mechanical Engineering						
Hydraulics						
Metallurgical						
Refrigeration, Heating						
Air Conditioning						
Welding						
8. Other						

B. DEGREE AWARDED	Engineering Technologies	Industrial Technologies
1. Associate in Applied Science		
2. Associate in Engineering		
3. Associate in Arts		
4. Other		

C. NEW CURRICULUMS BEING PLANNED--FORECAST 1964-1970

1. What kinds and levels? ______________________________

____

____

2. Has a survey been made? ______________________________

	President,	Board of Trustees,	Citizens Committee,	Curriculum Committee
3. Proposal approved by:	____	____	____	____
4. Budget approved:	____	____	____	____

5. What procedures do you use in establishing new curriculums?

_____(a) citizens' committee recommendations

_____(b) local occupational surveys

_____(c) requests of professional societies

_____(d) employer requests

_____(e) college curriculum committee suggestions

_____(f) high school counselors' suggestions

_____(g) requests of MESC, MDTA, etc.

_____(h) other ______________________

6. Are any curriculums being considered for ECPD accreditation? Yes ___ No ___

Would you consider ECPD (Engineers' Council for Professional Development) accreditation feasible within the framework of your operations? Yes ___ No ___

Comment ____

____

____

PART II. CONTENT, DISTRIBUTION, AND COURSE REQUIREMENTS

A. CURRICULUM SUMMARY	Semi-professional, Eng. Technician (credit hours)	Highly Skilled Ind. Technician (credit hours)	Pre-Engineering Transfer Student (credit hours)
1. Mathematics			
2. Sciences (chem., physics)			
3. Technical specialties			
4. Technical skills courses (drafting, mfg. processes)			
5. Communications (English)			
6. Humanistic social studies			
7 Total credits for degree			

B. SPECIFIC COURSES REQUIRED	(credit hours)	(credit hours)	(credit hours)
1. Humanities-Social Studies			
Economics			
History, U.S.			
Psychology			
Fund. industrial management			
Intro. political science			
American government			
Industrial orientation			
Physical Education			

B. SPECIFIC COURSES REQUIRED	Semi-Professional, Eng. Technician (credit hours)	Highly Skilled Ind. Technician (credit hours)	Pre-Engineering Transfer Student (credit hours)
2. English Communications			
Freshman English(transfer level)			
English (occup. students)			
Report writing			
Communications			
3. Mathematics			
Basic technical mathematics (including algebra, geom., trig., vectors, slide rule)			
Advanced technical mathematics (including functions, anal. geom., calculus)			
College algebra			
Plane geometry			
Solid geometry			
Plane trigonometry			
Analytical geometry			
Electrical/electronic math.			
Applied calculus for technicians			
Differential & integral calculus			
Differential equations			
Slide rule			

	credit hrs.	class hrs.	lab. hrs.	credit hrs.	class hrs.	lab. hrs.	credit hrs	class hrs	lab. hrs.
4. Basic Science									
Technical physics									
Gen. college physics									
Engineering physics									
Gen. college chemistry									
Technical chemistry									
Qualitative analysis									
Quantitative analysis									
Industrial physics									
Matallurgy									
Thermodynamics									

	credit hrs.	class hrs.	lab. hrs.	credit hrs.	class hrs.	lab. hrs.	credit hrs.	class hrs.	lab. hrs.
5. Supporting Technical Courses									
Mechanical drafting									
Architectural drafting									
Engineering drawing									
Descriptive geometry									
Kinematics (mechanisms)									
Manufacturing processes									
Statics									
Engineering Laboratory									
Strength of materials									
Materials and processes									

The University of Michigan

Community College Technical Education Study
Personal Interview Form

Community College

____

Person Interviewed ______________________

Title ______________________________

Duties ______________________________

PART III. RECRUITMENT, TESTING, SELECTION, AND GUIDANCE PRACTICES (for semi-professional and highly-skilled technician programs)

A. RECRUITMENT

1. Which of these recruitment procedures are used for technician programs?

_____ High school counselors
_____ Talks to community groups
_____ Mail promotion campaigns
_____ Liaison with industry
_____ Liaison with high schools
_____ College career day for high school students
_____ Brochures and publications
_____ Frequent news releases
_____ Other ______________________

2. Which of these do you consider most effective for guiding students into technical education programs?

	Very Effective	Some Success	Rarely	Never
Parents				
High school counseling				
Community college counseling				
Public information program (news media)				
Graduates of community college programs				
Industry promotional efforts				
College brochures				
Career day programs				

3. Are transfer students with academic difficulties guided into technician programs? Yes _____ No _____

If yes, how successful? ______________________

If no, why not? ______________________

4. Are technician students with academic difficulties guided into skilled trades programs? Yes _____ No _____

If yes, how successful? ______________________

If no, why not? ______________________

5. How many students were enrolled:

	1963	1962	1961
a) For semi-professional (engineering) technologies			
b) For highly skilled (industrial) technologies			

   c) Do you enroll women in technician programs?
      Yes _____ No _____
      How many are currently enrolled: _______ Which areas? ____________________

B. TESTING

1. Are all applicants for technical education curriculums given a battery of tests?
   Yes _____ No _____
   In high school _____ senior _____ junior _____
   Upon entering community college? _____ pre-registration _____ after registration _____

2. What tests or other criteria are used and what are the typical percentile cut-off scores (freshman national norms--%ile NN)?

	Semi-Professional (Engineering Technologies)			Highly-Skilled (Industrial Technologies)		
	Check if Used	Cut-off Scores		Check if Used	Cut-off Scores	
		Raw	%ile NN		Raw	%ile NN
a) Rank in High School Graduating Class						
b) EPSAT						
c) ITED 4						
d) ITED 2						
e) SCAT (Total)						
f) SCAT-Q						
g) SCAT-V						
h) CEEB - SAT						
i) G.E.D.						
j) Other						

C. SELECTION CRITERIA

1. In your opinion, which of these items are closely related to academic success in technical curriculums:

	Most Predictive	Somewhat Predictive	Not Significantly Related to Success
a) Rank in high school graduating class			
b) High school grade average			
c) Intelligence test scores			
d) Aptitude test scores (which?)			
e) Mathematics grades			
f) Physics grades			
g) Drafting grades			
h) English grades			
i) Shop grades			
j) Attitude			

2. What kind of high school preparation would you consider optimum for entry into and success in your technical education programs?

	Semi-Professional Eng. Technologies			Highly-skilled Ind. Technologies		
	Check	Units (Years)	Grade	Check	Units (Years)	Grade
High school graduation required						
College preparatory curriculum in high school						
Vocational (shop) curriculum in high school						
General curriculum in high school						
Algebra, elementary						
Algebra, intermediate						
Geometry, plane						
Geometry, solid						
Trigonometry						
Physics with laboratory						
Chemistry with laboratory						
English						
Drafting						
General shop						
SMSG (new math)						
PSSC (new physics)						

3. Would you like to see high schools initiate specialized pre-technical programs at the 11th and 12th grade level? _____

D. GUIDANCE

1. Full time guidance personnel _____ How many full time equivalent _____ Centralized guidance office _____
2. What is the ratio of students to full time counselors: a) college-wide _____ b) technical program _____
3. Are technician students given periodic counseling? Yes _____ No _____ Once a semester _____ Once a year _____ More often _____
4. About how much total counseling time is available to technician students per year _____
5. Are "transfer program" drop-outs advised to consider technician programs? Yes ___ No ___
6. Are technician drop-outs advised to consider trade or craft programs? Yes ___ No ___
7. Are counselors with significant industrial or engineering experience assigned to technician students? Yes ___ No ___
8. Comments _____

The University of Michigan

Community College Technical Education Study
Personal Interview Form

Community College

Person Interviewed ____________________

Title ____________________

____

Duties ____________________

PART IV. PLACEMENT

A. SERVICES

1. Is there a director of placement? Yes ____ No ____

   If no, who serves? ____________________ Percentage of time? ________

2. Do you have a CAREER placement program? ____________________

3. Do graduates make use of placement services? Yes ____ No ____

4. Can students get part time jobs through the placement office? Yes ____ No ____

5. Do you have a file on available technician jobs? Yes ____ No ____

6. Are placement files on graduates maintained for several years? Yes ____ No ____

7. Are graduates "matched" to job demands? Always ____ Often ____ Seldom ____

8. Are graduates placed: Comm. Coll. Area ____ In Michigan ____ Out of Michigan ____

9. How do you publicize the placement of your graduates? ____________________

B. FOLLOW-UP

1. What is the follow-up procedure? How long? ____ 2 yrs. ____ 5 yrs. ____

   ____

2. Is any "feedback" from graduates used to help improve the curriculum? Yes ___ No ___

   Explain ____

	Semi-Professional Technology			Highly-Skilled Technology		
3. Placement information						
Extreme demand						
Placed all recommended						
Not enough local jobs						
Entry pay range						
Pay after 5 yrs. on job						

4. Additional comments and observations ____________________

   ____

   ____

APPENDIX C

QUESTIONNAIRE USED FOR MICHIGAN HIGH SCHOOLS

(1) (2) (3) (4)

The University of Michigan

Community College Technical Education Study

Questionnaire for Michigan High Schools

To: Director of Guidance and Counseling

______________________ Your Name	______________________ High School
______________________ Your Official Title	______________________ Date

Instructions: Please feel free to give your professional opinions and ideas. Your identity and the name of your high school will not be revealed in any published report. All data and opinions will be used for statistical purposes only. This study deals only with semi-professional (engineering technologies) and highly-skilled (industrial technologies) offered as two-year, college level, associate degree programs in public community colleges. ENGINEERING TECHNOLOGY is a broad term used to identify those occupational areas closest to the engineer; nearly, but not quite professional in status. This kind of technician requires a high level of theoretical knowledge with some manipulative "know how" and works in support of engineering activities at the research and design level. INDUSTRIAL TECHNOLOGY is a broad term used to identify those occupational areas near the craftsman level. These are highly-skilled occupations and require a modest background in science, mathematics and technical theory. This kind of technician works in industrial jobs where the major emphasis is on production, maintenance, operation or testing.

This questionnaire is divided into four major areas:

Part I - Some Statistics About Your 1963 Graduating Class
Part II - Some Things About the Counseling Services at Your High School
Part III - Some Things About Community College Technician Programs
Part IV - Your Suggestions About Guidance, Counseling, and Technician Programs

Please write in the amount that reflects your best opinion or actual fact. If you wish, write in comments where needed or where you can add extra helpful data. NOTE: NUMBERS IN PARENTHESES ARE FOR COMPILATION PURPOSES ONLY.

Part I. Some Statistics About the Students in Your 1963 Graduating Class

1. How many students graduated in the 1963 class? ____________ (5-7)

2. Approximately how many of the graduates took the college preparatory course in high school? ____________ (8-10)

3. Approximately how many students took the (a) vocational or (b) industrial course? (a) ____________ (11-13) (b) ____________ (14-16)

4. Approximately how many students took the general course? ____________ (17-19)

5. How many of the 1963 graduates actually enrolled for further study at any kind of college? If exact data is not available, give your best estimate ________ (20-22)

6. To the best of your knowledge, how many of the graduates were advised or counseled to enroll in any kind of technician program at a community college? __________ (23-25)

7. How many of the graduates were advised or counseled to enter "transfer" programs at a community college? __________ (26-28)

Part II. Some Things About the Counseling Service at Your High School

Your counseling and guidance function has a most important and unique role in assisting youth to make decisions with regard to future educational plans and/or decisions about jobs. Therefore, the study seeks to gather some information concerning this very important phase of your high school program.

Please check one or write in the appropriate answer or opinion for each question.

8. As director of the guidance and counseling program, what is your counseling time assignment? (Check one) (29)

_____ Full time (1)   _____ 50% (2)   _____ 25% (3)

9. In terms of full time equivalent assignments, how many counselors serve the senior class in your high school? __________ (30)

10. How adequately do you feel your students are counseled in terms of career and occupational guidance? (Note that we are not concerned here with purely educational advisement nor with counseling on personal or emotional problems.) (31)

_____ Very Adequate (1)   _____ Adequate (2)   _____ Inadequate (3)

11. Is current and meaningful career guidance information readily available for students' use in your high school? (32) _____ Yes (1) _____ No (2)

12. When do you begin to counsel each student about his career? (33)

_____ Freshman (1)   _____ Junior (3)   _____ Not at all (5)
_____ Sophomore (2)   _____ Senior (4)

13. Do you have a "reading" room in your counseling office where students have ready access to a wide variety of occupational information? (34) _____ Yes (1) _____ No (2)

14. Please check each of the career guidance publications you have available and readily accessible to students.

_____ Occupational Outlook Handbook (35)
_____ Dictionary of Occupational Titles (36)
_____ Publications of the Michigan Employment Security Commission (37)
_____ Local community college catalogs (38)
_____ Michigan college and university catalogs (39)
_____ U. S. Office of Education publications (40)
_____ Michigan Department of Vocational Education publications (41)
_____ Publications and brochures in the engineering and industrial fields (42)
_____ Publications and brochures in the health occupations (43)
_____ Publications and brochures in the business fields (44)
_____ Publications and brochures in the public service fields (45)
_____ Other ______________________________
_____ ______________________________
_____ ______________________________

15. On the average, about how much guidance time does each student receive during his senior year? (Check one) (46)

____ 1 to 2 hours (1)
____ 2 to 5 hours (2)
____ over 5 hours (3)
____ only when he comes in and asks for it (4)

16. Which of the following standardized tests are used in your counseling program? (Check each one used)

____ SCAT-V (47)
____ SCAT-Q (48)
____ EPSAT (49)
____ ITED-2 (50)
____ ITED-4 (51)
____ CEEB (SAT) (52)
____ PSAT (53)
____ Others (54)
____

17. Do you and your counselors discuss two-year technical education programs and semi-professional and technical careers with your students? (Check one)(55)

____ Frequently (1)
____ Only if students ask about them (2)
____ Seldom (3)
____ Not familiar with technician programs (4)

18. To what extent to you consider work experience in industry, business, health, or related fields as being important in the overall preparation of high school counselors? Please check one (56)

____ Absolutely essential (several years duration) (1)
____ Important, but not as essential as college training in guidance and adolescent psychology (2)
____ Not considered important in making counselor assignments (3)

19. How well do you know the following personnel in nearby community colleges? Please check each one in the appropriate column.

	Very well (1)	Fairly well (2)	Only by Name (3)	Not at all (4)
Dean or president (57)				
Guidance director (58)				
Placement director (59)				
Director of the technical programs (60)				
One or more instructors in each each of the following areas				
Mathematics (61)				
Physics (62)				
Drafting (63)				
Chemistry (64)				
English (65)				
Electronics (66)				
Social Studies (67)				
Civil Technology (68)				
Chemistry Technology (69)				
Mechanical Technology (70)				
Computer Technology (71)				
Business Fields (72)				
Health Fields (73)				

20. Which of the following community college programs are discussed when college staff members visit your school?

	(1) Always discussed	(2) Often discussed	(3) Seldom discussed	(4) Never discussed
Transfer (lower division college parallel studies) (74)				
Technician programs (75)				
Business education programs (76)				
Public service education programs (77)				
Health education programs (78)				
Vocational education programs (79)				

21. Does the nearest community college supply you with: (Check Yes or No for each item)

	Yes (1)	No (2)
Catalogs and/or bulletins (5)		
Brochures on semi-professional and technical programs (6)		
English level preparation required (7)		
Science level preparation required (8)		
Mathematics level preparation required (9)		
Curriculum information for the various programs (10)		

22. Do you have a "Career Day" each spring for your senior students? (11) ___ Yes (1) ___ No (2)

23. If you have a "Career Day", which of the following categories of persons do you invite to your campus for consultation with students? (Check Yes or No for each item)

	Yes (1)	No (2)
Four year college representatives (12)		
Community college representatives (13)		
Potential industrial employers (14)		
Potential business employers (15)		
Government services representatives (16)		
Military recruiters (17)		

24. In what specific ways could the local community college be of greater assistance to you in counseling students whose future educational and career plans probably do not include graduation from a four-year college? (Write in comments) (18)

a. ____________________

b. ____________________

c. ____________________

d. ____________________

Part III. Some Things About Community College Technician Programs

Instructions: In this section, please check the following questions as best you can on the basis of your present knowledge or opinion, without "researching" or looking up the answers.

5. Below are listed three kinds of high school curriculums. Which of the three do you think would constitute the best preparation for a community college technical education program? (Check only one) (19)

Curriculum A ____ (1)	Curriculum B ____ (2)	Curriculum C ____ (3)
3 yrs. mathematics 3 yrs. English 2 yrs. lab. science 3 yrs. social science 3 yrs. foreign language electives	3 yrs. mathematics 3 yrs. English 1 yr. physics or chemistry 2 yrs. social science 2 yrs. drafting 1 yr. general shop electives	1 yr. mathematics 3 yrs. English 1 yr. social science 1 yr. general shop 1 yr. wood shop 1 yr. mech. drawing 3 yrs. machine shop 2 yrs. auto shop electives

26. An engineering technician is one who: (Check one) (20)

____ Does beginning engineering work (1)
____ Works with tools and machinery (2)
____ Is hourly rated as far as pay is concerned (3)
____ Has the status of a production worker (4)
____ Assists an engineer in design, research, and testing (5)

27. Which of the following programs at community colleges have the highest status and the lowest status in its general acceptance by students and their parents? Check the highest and lowest rank. Check also the two that rank next to the highest and next to the lowest.

	(1) Highest Status	(2) Lowest Status	(3) Next to Highest Status	(4) Next to Lowest Status
ndustrial technician program (21)				
usiness education program (22)				
ngineering "transfer" program (23)				
rade program (24)				
ealth education program (25)				
ngineering technician program (26)				
pprentice program (27)				

28. The two-year graduate engineering technician begins work at an average salary of about: (Check one) (28)

____ $400 to $450 (1)
____ $450 to $500 (2)
____ $500 to $600 (3)
____ Over $600 (4)
____ Less than $400 (5)

29. The industrial technician with a two-year associate degree begins work at an average salary of: (Check one) (29)

____ $300 to $400 (1)
____ $400 to $500 (2)
____ Less than $300 (3)
____ More than $500 (4)

30. After five years or more on the job, the two-year associate degree technician will earn per month, about: (Check one) (30)

____ $600 to $700 (1)
____ $700 to $800 (2)
____ Over $800 (3)
____ Less than $600 (4)
____ As much as a graduate engineer (5)

31. Engineering technician programs at community colleges usually require high school preparation in: (Check one or more)

____ Mechanical drawing (31)
____ Machine shop (32)
____ Geometry (33)
____ Physics (34)
____ Electricity (35)
____ Algebra (36)
____ English (37)
____ Trigonometry (38)
____ Wood shop (39)
____ Chemistry (40)
____ Typing (41)
____ Auto shop (42)

32. How much do your students seem to know about the occupational education programs of the nearest Michigan community college? (Check one) (43)

____ A great deal (1)
____ Reasonably well informed (2)
____ Some are well informed, some are not (3)
____ Very little (4)
____ No interest (5)

33. Does your high school offer any special courses or curriculums for students who express a desire to enter a technician program in a community college? (Check one) (44)

____ Yes (1) ____ No (2) ____ Doesn't appear to be a need for these (3)

34. If a student wants to enroll in a community college engineering technician program, what should be the approximate minimum standing in his high school graduating class? (Check one) (45)

____ 90th %ile (1)
____ 80th %ile (2)
____ 70th %ile (3)
____ 60th %ile (4)
____ 50th %ile (5)
____ 40th %ile (6)
____ 30th %ile (7)

35. If a student wants to enroll in a community college industrial technician program, what should be the approximate minimum standing in his high school graduating class? (Check one) (46)

____ 90th %ile (1)
____ 80th %ile (2)
____ 70th %ile (3)
____ 60th %ile (4)
____ 50th %ile (5)
____ 40th %ile (6)
____ 30th %ile (7)

36. Below are listed four typical high school curriculums. Which one do you think is the best preparation for a technical education program in a community college? (Please check one) (47)

____ College preparatory (1)
____ General (2)
____ Vocational (3)
____ Business (4)
____ Other (5) ________________

37. In your opinion, which of the following occupational fields will probably show the greatest percentage increase in employment in the next five years?. Please rank three of these with a check in the appropriate column.

	Greatest increase (48)	Second greatest increase (49)	Third greatest increase (50)
Stenographers (1)			
Scientists (2)			
Building trades workers (3)			
Engineers (4)			
Technicians (5)			
Skilled craftsmen (6)			
Semi-skilled workers (7)			

38. Please check any or all of the following semi-professional and technical programs which you know are offered at the nearest community college.

____ Chemical technology (51)
____ Automotive technology (52)
____ Computer technology (53)
____ Drafting technology (54)
____ Electrical technology (55)
____ Civil technology (56)
____ Nursing technology (57)
____ Data processing technology (58)
____ Electronics technology (59)
____ Industrial technology (60)
____ Mechanical technology (61)
____ Metallurgical technology (62)
____ Medical technology (63)
____ Law enforcement technology (64)

39. In your opinion, what can be done to make the technician occupations more "popular" with high school students as they consider future careers? Please check each item under the appropriate column.

	Extremely important (1)	Important (2)	Of little importance (3)
Better publicity in general news media (65)			
More and better placement of graduates of technical programs (66)			
More information to parents (67)			
More and better information to students (68)			
Clearer understanding of high school preparation required (69)			
Better facilities for technical programs at the community colleges (70)			

40. In your opinion, and drawing from your observations, how would you rate each of the following items for inclusion in a "PRE-TECHNICAL" curriculum for those high school students aspiring to enroll in two-year collegiate-level technology curriculums:

Please check each item appropriate to your opinion		Extremely important (1)	Fairly important (2)	Little or no importance (3)
English (communication skills)	(71)			
Foreign language - 1 or 2 units	(72)			
Social studies	(73)			
New mathematics sequence (SMSG)	(74)			
Algebra - 2 units	(75)			
Geometry - 1 unit	(76)			
Trigonometry - 1/2 unit	(77)			
Shop mathematics - 1 unit	(78)			
Physics with lab - 1 unit	(79)			
"New physics" sequence (PSSC)	(80)			
Chemistry with lab - 1 unit	(5)			
Biology - 1 unit	(6)			
Ind. arts wood shop - 1 unit	(7)			
Ind. arts metal shop - 1 unit	(8)			
Ind. arts electrical shop - 1 unit	(9)			
Drafting - 1 unit	(10)			
Vocational machine shop - 2 units	(11)			
Vocational electricity - 2 units	(12)			
Auto shop - 1 unit	(13)			
Adequate counseling	(14)			
Aptitude testing	(15)			
Adequate occupational information service	(16)			

Part IV. Your Suggestions About Guidance, Counseling, and Technician Programs

41. This page is extremely important! Your suggestions will be incorporated in future planning for the vast number of Michigan youth who need help in making career decisions.

    (a) What steps could your high school take to improve guidance services for future technician students? (17)

    (b) Do you anticipate any curriculum revisions and/or new curriculums in your high school for pre-technician study? (18)

    (c) How can the "image" of the semi-professional and technical occupations be improved? (19)

    (d) What are some needed services which Michigan community colleges might render to high schools in their attendance areas which would promote the growth of technician education? (20)

APPENDIX D

SUGGESTIONS FROM HIGH SCHOOL COUNSELORS

SECTION I - What Could the Community Colleges Do?

SECTION II - What Could the High Schools Do?

SECTION III - What Curriculum Revisions are Planned for Pre-Technician Study?

SECTION IV - What About the Status of the Technical Occupations?

SECTION V - How Can Community Colleges Promote Technical Education?

SECTION I

WHAT COULD THE COMMUNITY COLLEGES DO?

Publicity.

Come out and talk to students in classes.

More information on technical areas.

Admit more students.

Increase the "status" of their program.

They should show more interest.

Let us observe classes in technical training.

SECTION I

The first question asked the high school counselors was:

"IN WHAT SPECIFIC WAYS COULD THE LOCAL COMMUNITY COLLEGE BE OF GREATER ASSISTANCE TO YOU IN COUNSELING STUDENTS WHOSE FUTURE EDUCATIONAL AND CAREER PLANS PROBABLY DO NOT INCLUDE GRADUATION FROM A FOUR-YEAR COLLEGE?"

A random sampling of their replies follows:

1. We are making plans for next fall to have greater rapport between the senior high school counselors and community college counselors and heads of departments.

2. Have college administration place more emphasis on technical education. More publicity of technical education programs. Develop community awareness toward need of technical education. Do not raise standards that will exclude the type of student technical education aids the most.

3. Programmed student visitation to the college classes of technology. Motivating talks by students or graduates of technology to high school students in related fields. Sponsorship of demonstration-lecture type programs by industrial-technological personnel for high school students. Sponsorship of contests or awards for superior work done in high school classrooms, if feasible, as in drafting.

4. Should be more personal contact from community colleges. Better reporting of grades. Reporting of students that fail or drop out.

5. We enjoy an excellent liaison between our high school and college.

6. Provide information on these "non-academic" curricula. I think most counselors feel insecure in working with students desiring to pursue these fields of study.

7. Have visitation days for our students. Open house for our faculty. Visits by students and orient them to the value of community college.

8. We have no community college in this community. We need one badly.

9. We receive written publications and personal visits from the community college staff now in any measure we need.

10. Provide more information on the program. Provide an opportunity for interested students to talk with someone in the departments in which they are interested. Apart from counseling our local community college could redefine its objectives. It requires the same type of English for freshmen (a trans-

fer program as on terminal technical programs.

11. Keep us informed on new programs and changes in old programs. Encourage visits to high schools by placement personnel.

12. Offer clinics for counselors where specific technical programs could be explained and discussed. On small group basis if possible. I'd even attend short term classes on this basis. If we counselors became more aware of technical training and had better knowledge of the programs, I'm sure that our students would benefit.

13. Description of course content and requirements in science and math for the technical programs.

14. We have a very good relationship with Henry Ford Community College. We are interested in grades of our students.

15. Slant its trend more toward the technical and terminal and less toward pre-college and pre-professional.

16. First, get a community college started in this region.

17. Visit the high school and speak to students about their programs.

18. Offering evidence that community colleges do prepare for specific careers. Provide aptitude screening for enrollments by proposed programs.

19. Feed-back of follow-up studies conducted by the college.

20. We always receive immediate help from the college.

21. By providing a wider range of curricula.

22. Provide information of specific technical programs. Provide information of entry qualification. Make these courses available.

23. Remove the stigma of the name "community" or "junior college." (Some students would prefer to go to a private technical school because of fear of having to take a lot of "frill" courses.)

24. Representatives from community colleges practically never visit the school. We would like to know them. Provide extra information about specific fields by special brochures.

25. Give entering students more counseling on program selection.

26. More scholarship assistance needed for technical programs—or better loan programs.

27. By clearly defining a philosophy of community college concept which would emphasize terminal education to the same degree that four-year programs are emphasized.

28. They should visit us more often. They should send us reports of students' progress.

29. We need a community college closer than 30 miles.

30. Junior colleges could mention that their main role need not be to get students ready for admission to a full senior college.

SECTION II

WHAT COULD THE HIGH SCHOOLS DO?

Build up the status of the industrial department.

Provide an information center on technical information.

Practical counselors.

Provide visitation opportunities.

Set up group guidance sessions.

More information and better counseling.

Improve the counselor-pupil ratio.

Field trips to see technicians at work.

SECTION II

The counselors were asked to express their opinions about improving guidance services as follows:

> "WHAT STEPS COULD YOUR HIGH SCHOOL TAKE TO IMPROVE GUIDANCE SERVICES FOR FUTURE TECHNICIAN STUDENTS?"

A random sampling of replies follows:

1. A systematized program of vocational counseling beginning in junior high school. This would include coordination of class instruction and counseling.

2. A program aimed at 10th and 11th grades to overcome the prejudice that parents have instilled in their youth regarding technical programs. A program which would include skill development as well as technical knowledge.

3. Improve the counselor-student ratio. Workshops and in-service training for counselors to help them become better informed about technical programs.

4. Improve our pre-technical programs. More exploratory opportunities.

5. Recognize that there is a program for these students. Give them the same amount of time we give the college-bound students.

6. Reasonable student-counselor ratio. Exclude administrative duties from the counseling office. Development of guidance-oriented staff.

7. Bulletin board displays. Career day. "Technical center open house."

8. Speak in terms of dignity going with the technician and not as a second-rate vocation. Show the value and need for these students in our future world and communities.

9. Train counselors in the importance of the program. Tradition and background void most counselors for the role of vocational counseling.

10. More information available on local or area needs for technicians. More opportunities for high school students to see technicians at work and hear from those on the job.

11. Let potential technician students know the prerequisite for entering the technical program. Too often we have found that the general student with very little math and science has felt the technician program was a place where he could succeed.

3

12. Career seminars—one a week using local people—tool and die, etc. (We are doing this.) Also we are sending a newsletter to parents—including mostly terminal and technical information, courses, etc.

13. Incorporate in the curriculum more opportunity for practical applications such as vocational training facilities. Place equal emphasis on technical training courses as on our college preparatory courses. Encourage some of the higher ranking students to consider technological training as well as college training.

14. Closer and better relations have to be developed between junior colleges and high schools. I feel relations between four-year colleges and high schools have become better over the years—the same must be done here. Everyone knows (pretty well) how to aid the top 10-25 percent, but little thought has been given to the middle group of talented kids. Hence: Better communications is urgently needed!

15. Closer correlation between high school and college science and math teachers. Closer correlation between high school and college English teachers. Technical students should not be taking same English as transfer students! They need more report writing, less critical analysis of literature.

16. Better understanding of the technical program by high school counselors. This could come about by better public relations on the part of the community college.

17. Provide adequate office space for counseling, including a reading room where career and other information could be available to students, parents and guidance workers. Improve the counselor-student ratio and leave the counselor free to counsel.

18. Establish a post-high school counseling bureau. Systematized program of occupational speakers and field trips to industries.

19. Obtain better vocational information in this area and use more competent persons as resource people.

20. By placing greater emphasis upon vocational information for this occupational level, by upgrading the status of these occupations in the eyes of the teaching staff.

21. Our library has a complete occupational file, and some teachers have an opportunity to acquaint some classes. This could be expanded with proper help of additional guidance personnel, additional use of personnel from business and industry at proper time.

22. Lower counselor's load. Provide clerical help.

23. Meetings with parents of marginal students—those enrolled in college preparatory courses but not performing very well. In-service training for teachers to provide more information of the need for technical workers. Encourage classroom teachers to use community resource people from technical fields in class work.

24. Improve our vocational library. Have more representatives come in from community colleges. Work guidance into course presentation.

25. I think we are doing a very good job now—we have two full-time people for 550 pupils, plus cooperation from all teachers.

SECTION III

WHAT CURRICULUM REVISIONS ARE PLANNED FOR PRE-TECHNICIAN STUDY?

Only in physics.

Electronics.

Addition of auto shop.

Physics and algebra for vocationally oriented.

Addition of technical mathematics.

Group guidance course.

SECTION III

The counselors were asked this question concerning curriculum revisions:

"DO YOU ANTICIPATE ANY CURRICULUM REVISIONS AND/OR NEW CURRICULUMS IN YOUR HIGH SCHOOL FOR PRE-TECHNICIAN STUDY?"

A random sampling of their replies follows:

1. Not at present—we are putting in a shop math course.

2. Distressed economic situations in the area make new facilities and teachers unattainable.

3. The industrial arts department is working on curriculum revision.

4. Presently we are attempting to develop a technical math program that will offer a challenge.

5. Our industrial education department is in the process of revising our ucrriculum to fit the industrial needs of our students.

6. Yes. We might modify some science and mathematics courses to meet the needs of the "middle third," if we had some assurance that they would be successful in technical programs.

7. Nothing on pre-technician, but great change in vocational.

8. Yes—electronics, basic math, including trig, algebra, and geometry on practical level.

9. Not immediately. Our major problem is what to do for the 80-95 I.Q. student.

10. We are striving to broaden our industrial arts program to include separate classes for technical-bound students in drafting, electricity, machine shop, auto mechanics, etc.

11. Yes—electronics, key punch, industrial arts, business program.

12. I am hopeful that changes will be made in the next couple of years. With emphasis on the "employment bound youth" these days, and with 75 percent of our students in the latter group, we are doing background talk about changes. I am very hopeful of coming changes.

13. No. We believe we are ready to contribute many good boys and girls who are ambitious when places for them are available. The difficulty is not here nor in the other high schools, but in the attitude of the admissions officials of the colleges and universities and the unwarranted lack of common, everyday, well-equipped classrooms. A good vocational teacher often has not been and need not be a man or woman from the upper decile.

14. Yes, and this is a must.

15. Yes. Only time will have to be taken before we can do this.

16. We have had curriculum revisions for the pre-technician program and I hope we will continue to have more revision.

17. Yes. We will add electricity to our curriculum in 10 grade. We also plan to discuss in our orientation classes in 9th and 10th grades.

18. Not a new curriculum, but we are anticipating having courses in auto shop and electronics and improving our print shop and wood shop.

19. Yes, we are visiting schools in technical areas to find what we may do to improve our position.

20. Only in physics.

21. We have a new high school which will be open in the fall of '65—new shops, wider area of opportunity in science, math, etc.

22. Physics and algebra for vocationally oriented in addition to college prep.

23. Yes, we have to change and improve our industrial arts program. Two and three hour programs instead of one hour classes.

24. Yes—the curriculum consultant has stated we are turning our emphasis in this direction.

25. Possible broadening of industrial arts curriculum. Put in industrial math this year. Power mechanics next year.

26. Yes. Perhaps not solely for this, but we have grown explosively and recognition is being given to the fact that we are not solely a college preparatory high school.

27. Addition of auto shop. Addition of shop math. Group guidance course to better orient student.

28. If we were more aware of these programs we might revamp our curriculum.

29. Yes, we hope to have technical mathematics.

30. Yes, gradually, but community pressures are on college prep.

31. Yes—two years of electronics.

32. No—we offer all of the courses needed for pre-technician study.

33. Electronics.

SECTION IV

WHAT ABOUT STATUS OF THE TECHNICAL OCCUPATIONS?

Public relations by companies and colleges.

Contact with men in the field.

More information in press to students and parents.

Emphasize the need and importance.

Industry must try to create a better image.

This is the biggest problem we have.

SECTION IV

This question was asked the high school counselors concerning the status of technical occupations:

"HOW CAN THE "IMAGE" OF THE SEMI-PROFESSIONAL AND TECHNICAL OCCUPATIONS BE IMPROVED?"

A random sampling of their replies follows:

1. If potential tehcnicians realized that much of the glamor of research, development, and design is done by technicians possibly more students would be interested in this growing field.

2. Less emphasis that these occupations are for the top 25 percent of student group—more emphasis that the average boy could be trained in these areas. Students in the training programs to talk to high school students.

3. Leave out the word "technician," use terms like "intern" and "junior engineer."

4. Educate students and parents. Emphasize the need for technicians. The American way has been to meet our local and national needs in every area of economic activity.

5. We need a community college in this area that offers such programs.

6. Elevation of these occupational groups in "status" in our community. Added publicity of these occupations and opportunities.

7. Respect offered two year students. Not so much emphasis placed on B.S. or M.S. degrees.

8. Parents need to learn the difference between these types of jobs and an assembly line occupation. Educators must also give time, effort, and strength to improving this portion of the program.

9. This is the core of the problem. These courses are hard to sell. Everyone wants a four-year college education.

10. Talks from people in the field. More career days—with emphasis on the semi-professional and technical occupations. Play down the idea that those students who attend the community college and enter into the field are not "smart enough" to go to a four-year college.

11. At present it is good in our school. Many parents are engaged in semi-professional work and the young people recognize how important it is to

be so trained.

12. Give the students an opportunity to hear from people who are happy and successful in the semi-professional field.

13. Better publicity! When we give as much time and space to this area as we do to colleges, we should get results.

14. Parents, teachers and school administrators must first change their attitudes toward these occupations before we can expect to have the "image" elevated in the eyes of our young people.

15. Somehow impress upon parents the idea that not all people should be four-year college graduates.

16. Encourage higher ranking students to enter. Make pay scales attractive. Promote programs emphasizing importance, need, and group status of the technical ranks.

17. There is nothing wrong with the image—it just has to be "projected." People must be made aware of the overwhelming advantages of such an education.

18. It isn't so much a question of improving image in this community as it is informing students of the great need for technicians and of opportunities available.

19. The image of semi-professional and technical occupations could be improved by a concentrated publicity campaign that deals with specifics rather than generalities.

20. Publish salary, publish job descriptions, working conditions, name employers.

21. In our community these occupations have a good image because many fathers have a somewhat lower occupation.

22. Attractive posters. Good examples in area industry. Sponsored tours. Upgrading of industrial arts departments in high school.

23. By publicizing the need for workers in the field in the mass media. Many students who lack the ability to complete four years of college are unaware of the cppurtunities available upon completion of a two-year terminal course.

24. For one thing they are too inarticulate about their programs and what they are doing and the important contribution they are making to society and the economy. An alert, dynamic director of vocational education is needed.

25. Continued emphasis on dignity of labor and part they play in our economic society.

26. Through advertisement—radio and television programs on what the semi-professional worker does.

27. Students want engineering, but as soon as you mention technicians, a number lose interest.

28. Salesmanship on the part of the colleges to bring about the realization that our society is sadly lacking in the technically skilled area.

SECTION V

HOW CAN COMMUNITY COLLEGES PROMOTE TECHNICAL EDUCATION?

Give us follow-up material on some of their graduates.

College nights, senior group counseling.

Personal contact with school personnel.

Better communication.

Guides to better identification of the potential technician.

More scholarships.

In-service programs for the high school faculty.

SECTION V

The following question elicited opinions on how the community college could help in promoting technical education:

"WHAT ARE SOME NEEDED SERVICES WHICH MICHIGAN COMMUNITY COLLEGES MIGHT RENDER TO HIGH SCHOOLS IN THEIR ATTENDANCE AREA WHICH WOULD PROMOTE THE GROWTH OF TECHNICIAN EDUCATION?"

A random sampling of the replies follows:

1. A more energetic recruiting program for the better students. At present most community colleges do not "sell" their programs.

2. Communicate directly with students on the tenth grade level in regard to the technician programs.

3. Offer technical courses along with academic courses. At the present they are merely junior colleges for academic institutions.

4. Provide financial help (via local businesses and industries) for students particularly interested in this field.

5. Clarify the picture. Films, speakers, etc. Most parents feel that the boy with an interest in math and science must be an engineer or all is lost. We also need to show that girls make wonderful technicians and the demand for their services also exists.

6. The community colleges should be more agressive and go to the high schools with in-service programs that will explain to teachers and students the purpose and goals of this type of training.

7. Be sure their programs are up to date so they won't train for a dead job.

8. We see college and university admissions officers constantly. I have never seen anyone from a community college.

9. Community colleges could emphasize technical courses as well as courses for continuation in universities. The colleges are now so filled with students bound for professions that there is little room for technical training.

10. Send representatives—work through teachers as well as counselors. More often than not, those students who would go into technical programs are not completely informed by a person whom they admire and respect.

11. Supply us with more information. Have representative call on us if possible. Everyone wants the upper half of our students. Our greatest problem is guidance of those in the lowerhalf; particularly the "middle third."

12. Closer coordination between math and shop teachers with junior college faculty from the technical area.

13. The local community college is very helpful in rendering services to our high school; representatives talk with our students; opportunities are given to students to visit. We hope this relationship can continue.

14. Present programs should be enhanced with more adequate equipment; the use of outdated equipment discourages youngsters from entering the program. Instructors in the technical programs could be of help by visiting the high schools and talking with students.

15. Send representatives to the schools to present programs to freshmen and sophomores in which technical offereings are described.

16. Visit several times per year and get to know secondary school people.

17. Supply more speakers for high schools that can talk effectively. Let us know what is happening to students we send to them. We have no data to tell other students about the effectiveness of their programs. Send successful graduates to talk to students and teachers and counselors. Assist in the developing of a more realistic high school curriculum.

18. Posters for school use, articles in newspapers.

19. Offer these technical programs in the college. Print special brochures of each field offered, requirements, job opportunities, general descriptions of what the work involves. Present talks and offer audio visual material to promote the programs. Newspaper articles and radio announcements that may acquaint parents with opportunities in technological fields.

20. There must be a "blending" of courses between high school and community college in the vocational area. A community college can help best if we counselors can plan a student's program knowing proper advanced training is available.

21. Make available staff personnel who will make an attractive presentation of the program—through movies, slides, interesting speakers, personal conferences.

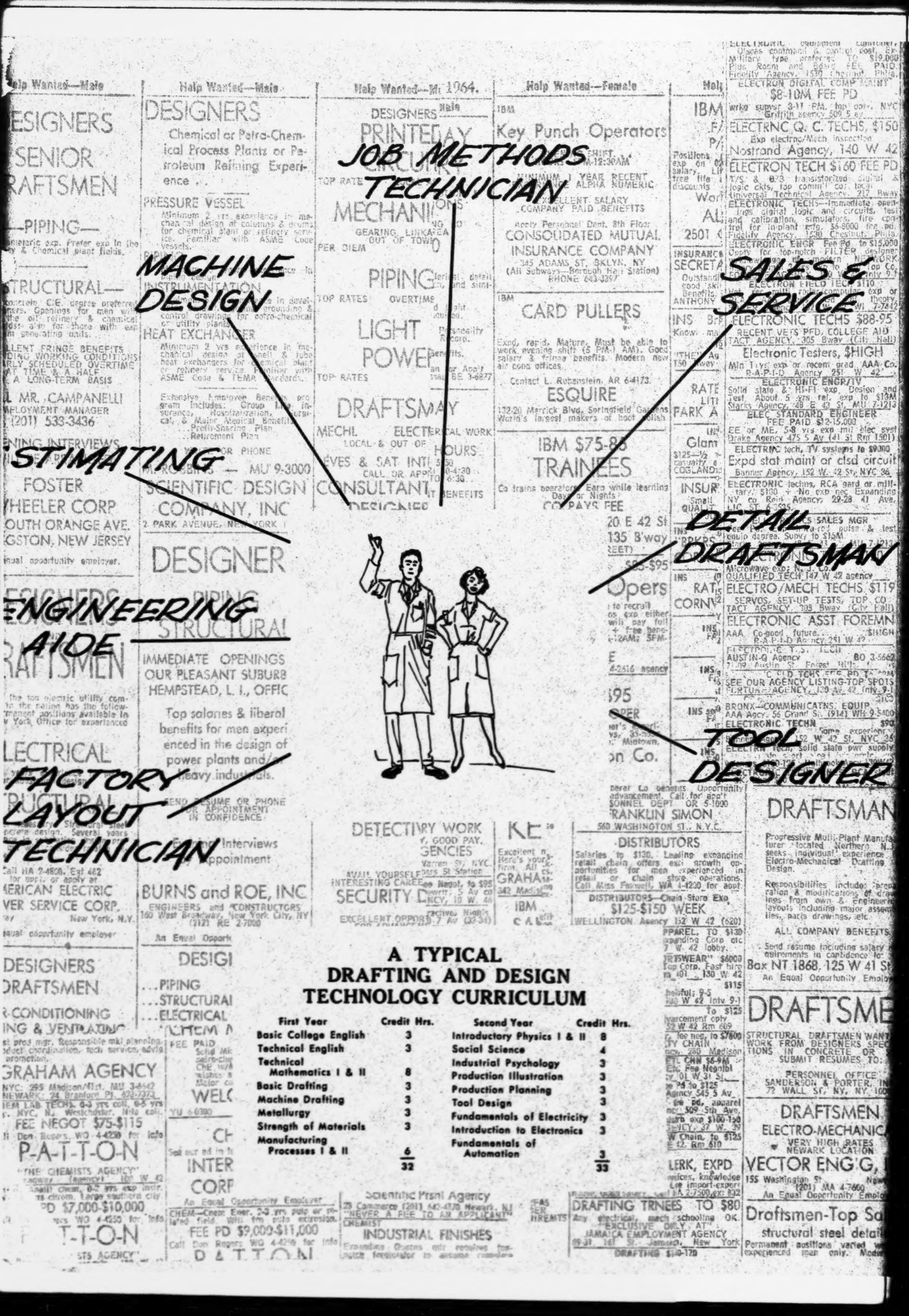
22. Promote an engineering technological program that would earn accreditation by the Engineers Council for Professional Development. Continue expansion of facilities and programs. Utilize mass media for publicizing ef-

fective work being done by graduates in local industry. Sponsor public "technician tours" of exhibits at civic centers.

23. Posters—for shop, drafting classrooms showing advantages, possible wages—stress importance of good high school background for tech courses.

24. Visit the high schools. Offer assistance in coordinating programs. Interpret some of their courses more specifically. Instead of saying "high school diploma needs" list the courses that will help this individual be better prepared for his technical training. Counselors don't always know what community colleges want.

25. Closer coordination with industry—more coordination with industries that will use these graduates.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